The Electrical Industry's Weekly Magazine

August 20, 1956

Electrical World

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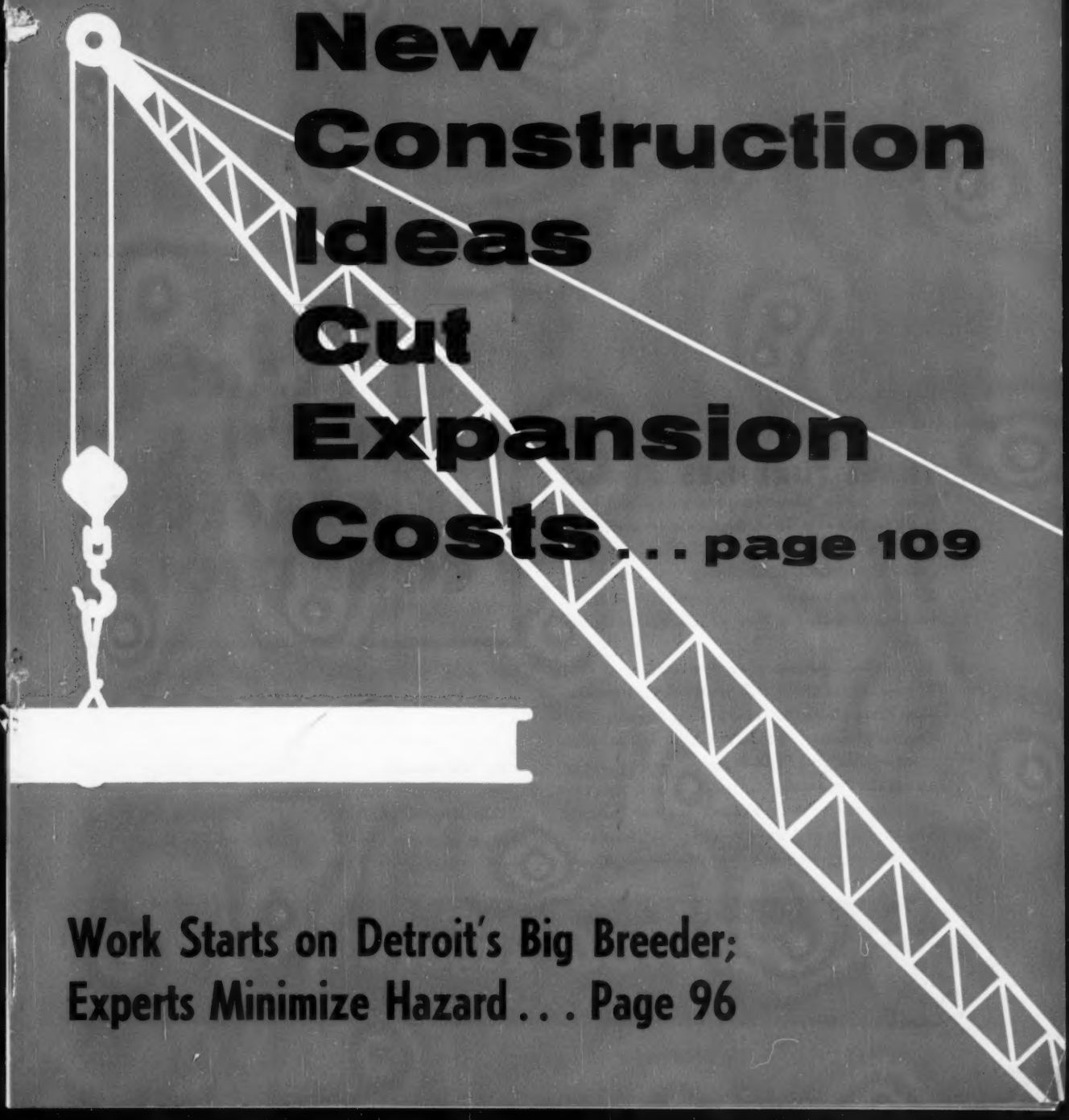
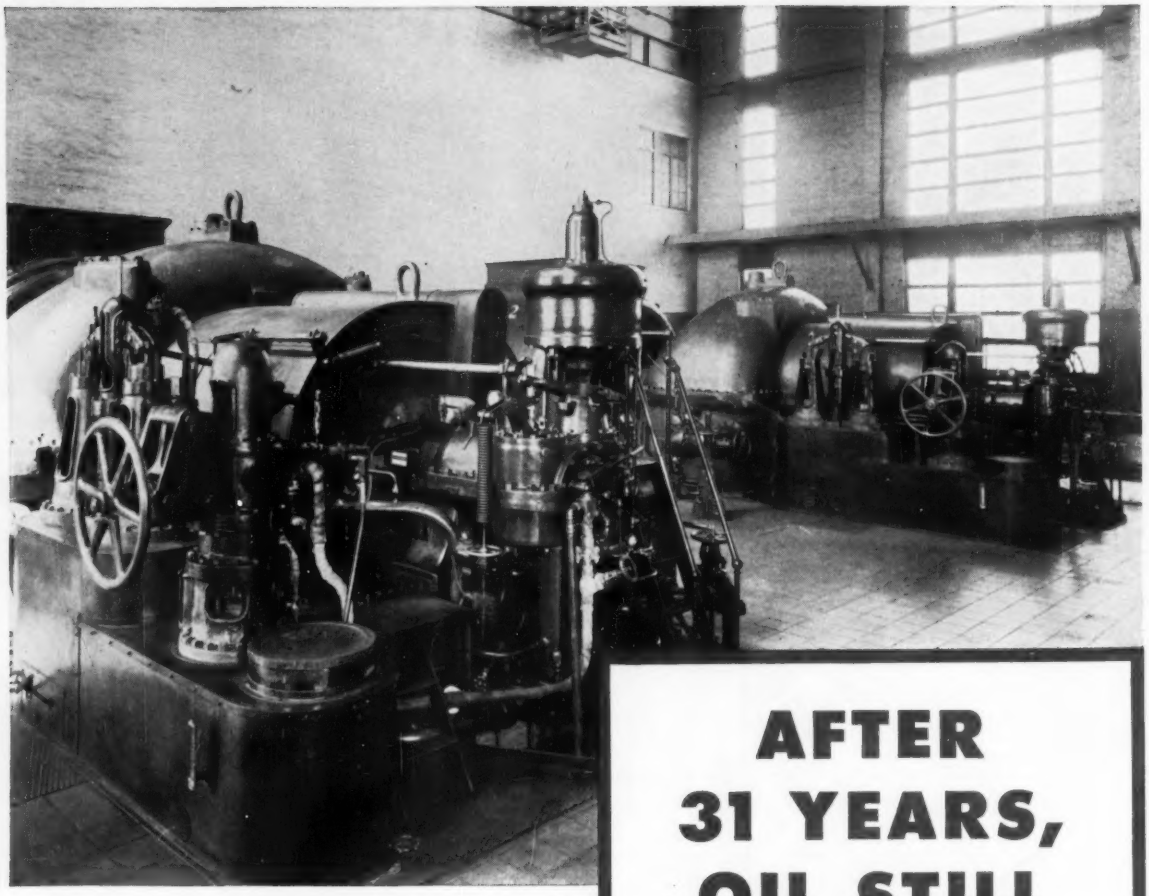


New Construction Ideas Cut Expansion Costs

... page 109

Work Starts on Detroit's Big Breeder; Experts Minimize Hazard

... Page 96



AFTER 31 YEARS, OIL STILL IN PERFECT CONDITION

THESE TURBINES at a leading Eastern power plant (name on request) have been exclusively Texaco-lubricated since they went on the line back in 1925. Today, 31 years later, without draining and changing, the oil is still in excellent condition and the systems completely free of sludge, rust and foam.

Turbine operators everywhere find that *Texaco Regal Oil R&O* assures extra protection throughout an extra long service life. Careful refining of selected base stocks, plus effective additives and extra processing, make an oil that prevents sludge, rust and foam — keeps systems clean, assures normal bearing temperatures and instant governor response.

There is a complete line of *Texaco Regal Oils R&O* to meet the stringent requirements of all leading turbine builders, for all types and sizes of turbines.

Let a Texaco Lubrication Engineer help you step up efficiency throughout your power plant. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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Electrical World

Published for 82 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Vol 146, No. 9 **August 20, 1956**

ELECTRICAL WORLD'S INDUSTRY REPORT

NEW CONSTRUCTION IDEAS CUT EXPANSION COSTS 109

MANAGEMENT

MIDDLE SOUTH UTILITIES WOOS STOCKHOLDERS 102
Electrical Business Outlook ... 19
Statistics 20
Your Business 21
Finance and Regulation 212

DISTRIBUTION

SUMMER LOADING ANALYSIS URGENT ..... A. M. Lockie 104
265/460-V UNDERGROUND CHEAPER FOR URBAN AREAS
H. S. Smith 106
PRE-ASSEMBLING SWITCHES CUTS OUTAGE, LABOR ..... E. H. Braid 138
REBUILDING COUPLING CAPACITORS SAVES
E. W. Meador, M. M. Bostian, and R. C. Cruise 140

TODAY'S DESIGN TRENDS

LOAD SURVEY DATA RECORDED ON TAPE ..... T. D. Barnes 125

ENGINEERING REFERENCE SHEET 134

INDUSTRIAL APPLICATIONS 148

HEATING AND COOLING ELECTRICALLY 154

SALES AND SERVICE 156

INDUSTRY NEWS

Electrical Week 94
Current Events 96, 208
Meetings Calendar 206
Manufacturing and Markets ... 190
News About People 198

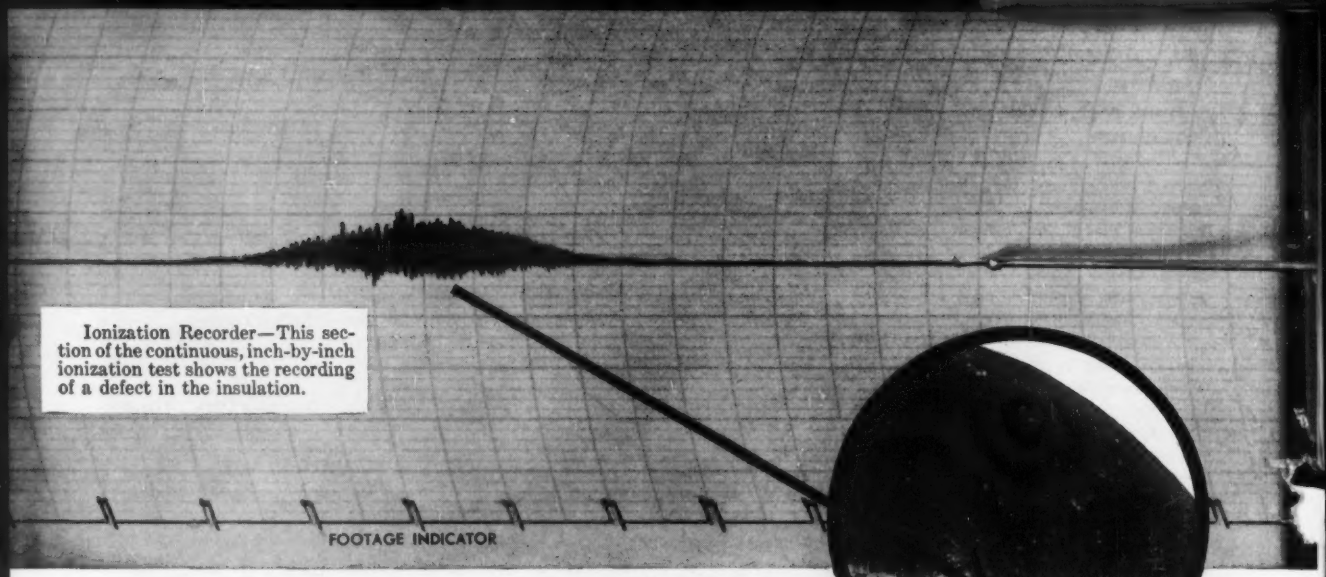
EQUIPMENT NEWS

New Equipment 162
Technical Literature 185
Catalogs and Bulletins 182

EDITORIAL AND COMMENTARY

Technical Notes 122
Editorial 93
Washington Comment 22
Books 186

INDEX OF ADVERTISERS 215



Ionization Recorder—This section of the continuous, inch-by-inch ionization test shows the recording of a defect in the insulation.

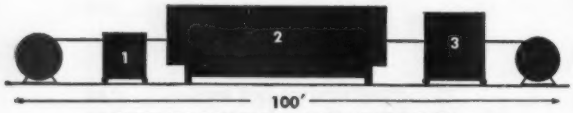
This void was detected by the "Gooding Test Train" ionization test. It was *not* detected by any of the industry's standard test procedures.

New Testing Procedure developed by Okonite

"Gooding Test Train" detects flaws in insulated power cable (4kv and over) heretofore unrevealed by standard tests

The "Gooding Test Train" has significant value to cable users. This new system of *non-destructive* testing, developed and used only by Okonite, reveals imperfections which are frequently not detected by ordinary testing procedures. Some of them even slip by Okonite's super-voltage a-c and d-c tests (highest used in the industry) and "full reel" corona tests.

The "Gooding Test Train" consists of a series of three test sets. The entire length of cable passes consecutively through each set as follows:



SCHEMATIC DRAWING OF GOODING TEST TRAIN

1. Uniformity Test—A uniformity gauge continuously checks insulation thickness—locating any thin spots which might cause premature failure.

2. Ionization Test—This is the most important unit of the "Gooding Test Train". It can measure the corona level at any spot along the cable. Procedure is to test the cable *inch-by-inch* at a predetermined voltage which is sufficient to assure the user that the corona level is at least 1½ times the rated voltage. Voids and imperfections as small as a grain of sand have thus been identified and removed.

3. X-Ray Test—X-ray inspection of the cable is performed by a 250,000 volt X-ray machine. This determines the nature and extent of any of the flaws indicated above.

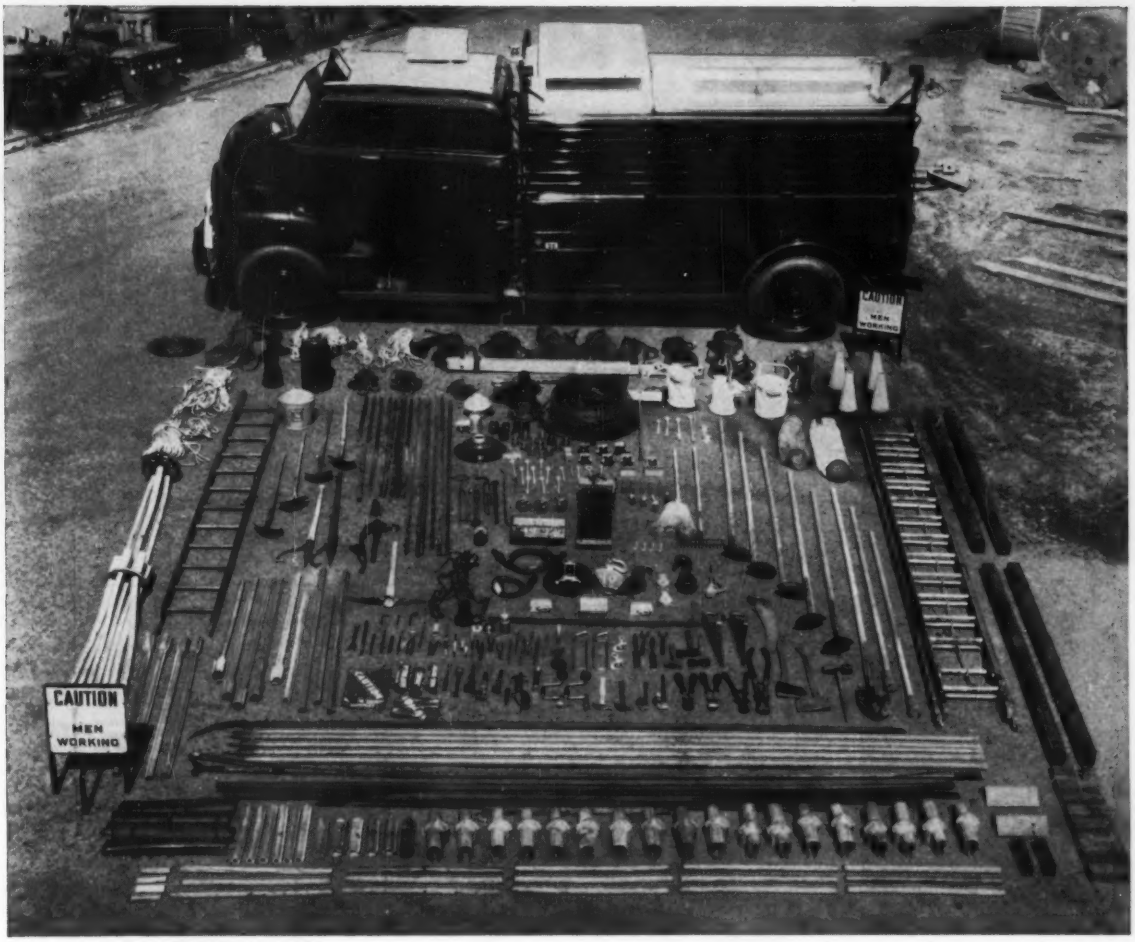
By such intensive testing, it is possible to eliminate previously unidentified imperfections that might otherwise lead to premature failure. Studies of such defects also help to identify the cause and permit preventive measures. The "Gooding Test Train" is now being used to test all Okonite's rubber-insulated cables rated at more than 4000 volts. It is a long step towards securing the "perfect cable" and, as such, of tremendous benefit to cable users.

For detailed information about Okonite's G.T.T. write for new Bulletin EW-1100, to The Okonite Company, Passaic, N. J.

3804

OKONITE PASSAIC, N.J.

OKONITE SINCE 1878 *insulated cables*



Look at your line truck equipment needs from this angle . . .

Here's a poles-eye view of a typical utility line truck showing the wide variety of construction and maintenance tools and safety equipment your linesmen need for most day-to-day jobs. But—without exception—each and every item shown can be ordered conveniently from your nearby Graybar office or warehouse . . . and in every case you get the type and quality needed to assure speed and efficiency on the job *plus* long years of satisfactory service. All are products your linesmen know and respect—products that have been tried, tested and proven in the field by scores of companies just like your own.

Remember, when you order "via Graybar", you save the time and expense of multiple inquiries, for you can select, from this single source, the items best suited to your needs from among the products of over 200 of the nation's leading manufacturers.

Graybar is thoroughly familiar with utility requirements. Further, your nearby Graybar Representative stands ready to help as a convenient source of information on everything needed for pole-line construction and maintenance. And should you be faced with an out-of-the-ordinary problem, call on the experience of a Graybar Outside Construction Specialist for a consultation. We'll welcome your inquiry!

511-98

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Graybar Everything Electrical

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420 Lexington Ave., New York 17, N. Y.

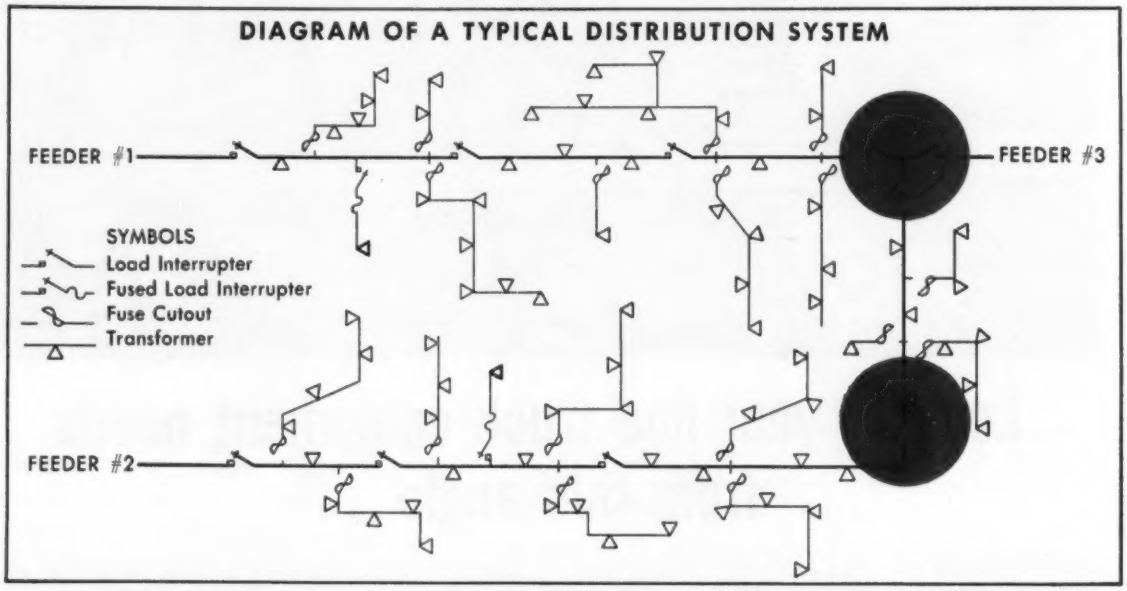
IN OVER 130 PRINCIPAL CITIES

ARE BIGGER LOADS BRING IN SWITCHING YOUR 12 KV

With S&C Load Interrupters you can handle *all* switching duties on a typical distribution feeder—any load current, charging current, or magnetizing current.

With conventional disconnects or horn gaps, higher voltages and higher currents can mean serious trouble. With the S&C Load Interrupter there is no external arc, no danger of flashover, no hazard to personnel, no uncertainty. It can open the circuit *under any condition* except short circuit.

Whether your switching problem is at a feeder tie (see illustration below), at a sectionalizing point on a feeder, or at a branch tap, the S&C Load Interrupter will give you safe, positive, circuit interruption.



Typical application of S&C Load Interrupters (symbol) on distribution feeders. Circled in blue are specific cases—feeder tie points. Even here increased loads have made switching difficult in spite of the fact that parallel circuits are easier to open. Load Interrupters may be opened or closed on full line voltage and full load current—a real advantage during emergency conditions and a definite convenience under *normal* circumstances.

S&C

LOAD INTERRUPTER

Specialists in High-Voltage Circuit Interruption since 1910

S&C ELECTRIC COMPANY

ING BIGGER HEADACHES DISTRIBUTION FEEDERS?

Performance Comparison of Switching Devices

PERFORMANCE	S&C Load Interrupters		Conventional Disconnects	
	Stick-Operated	Group-Operated	Stick-Operated	Group-Operated
Interrupt current from parallel sources safely?	YES	YES	DOUBTFUL	DOUBTFUL
Safe to equipment or personnel if inadvertently opened on full voltage (in case loop is open)?	YES	YES	NO	DOUBTFUL
Dump load without opening feeder breaker, or without preliminary unloading?	YES	YES	NO	DOUBTFUL
Multi-pole device controllable from ground (may be required by system practice or other circuits on same pole)?	NO	YES	NO	YES
Simple to install?	YES	NO	YES	NO
Cost?	LOW	HIGHEST	LOWEST	HIGH

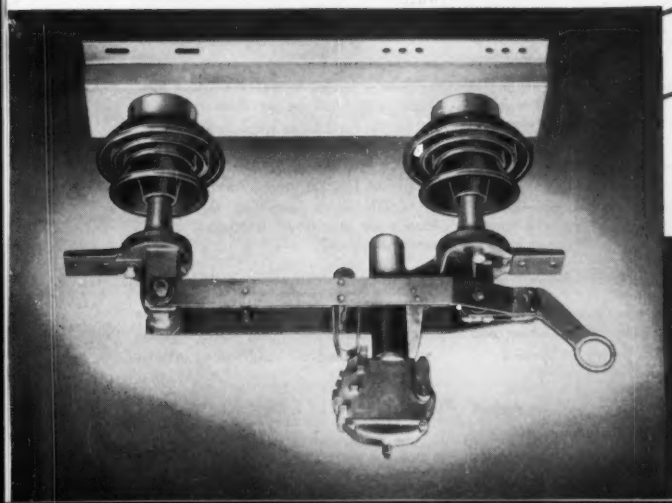
ABOUT THE S&C LOAD INTERRUPTER

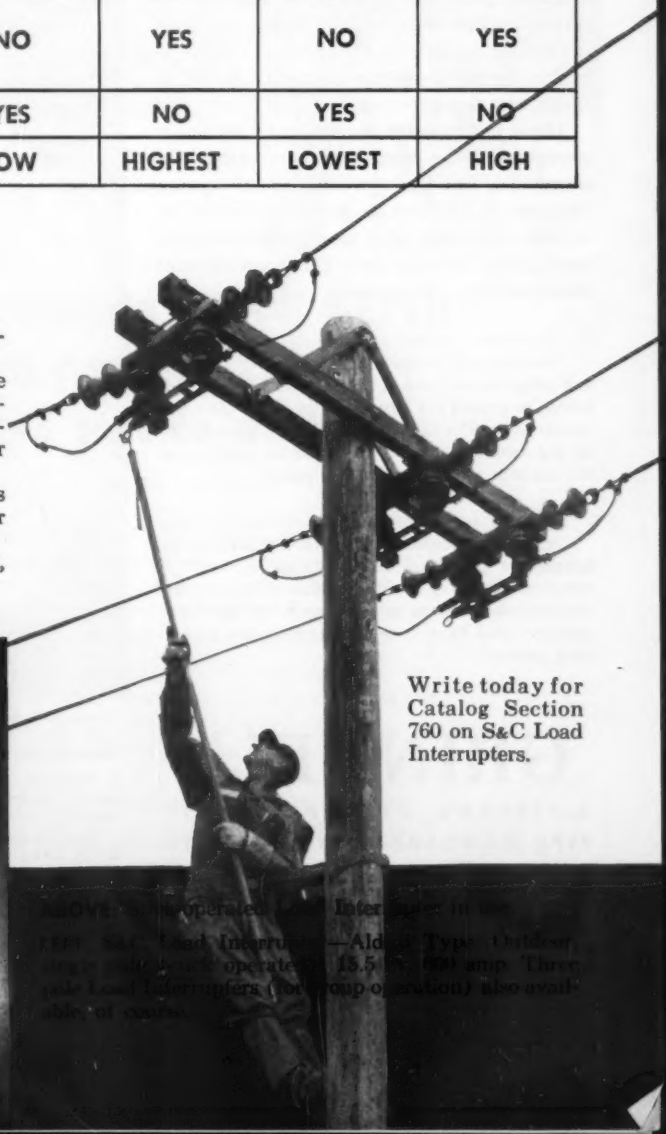
It can switch the circuit without unloading preliminaries and without opening the main breakers.

Switching cannot lead to dangerous phase-to-phase or phase-to-ground faults, because there is NO EXTERNAL ARC. Hence, there is no danger to men or equipment, even in case of inadvertent operation under emergency conditions.

It interrupts all load currents and charging currents instantly, making a clean, decisive break. The operator doesn't have to "dog" it.

It can be mounted in any desired position—vertical, upright, or inverted.



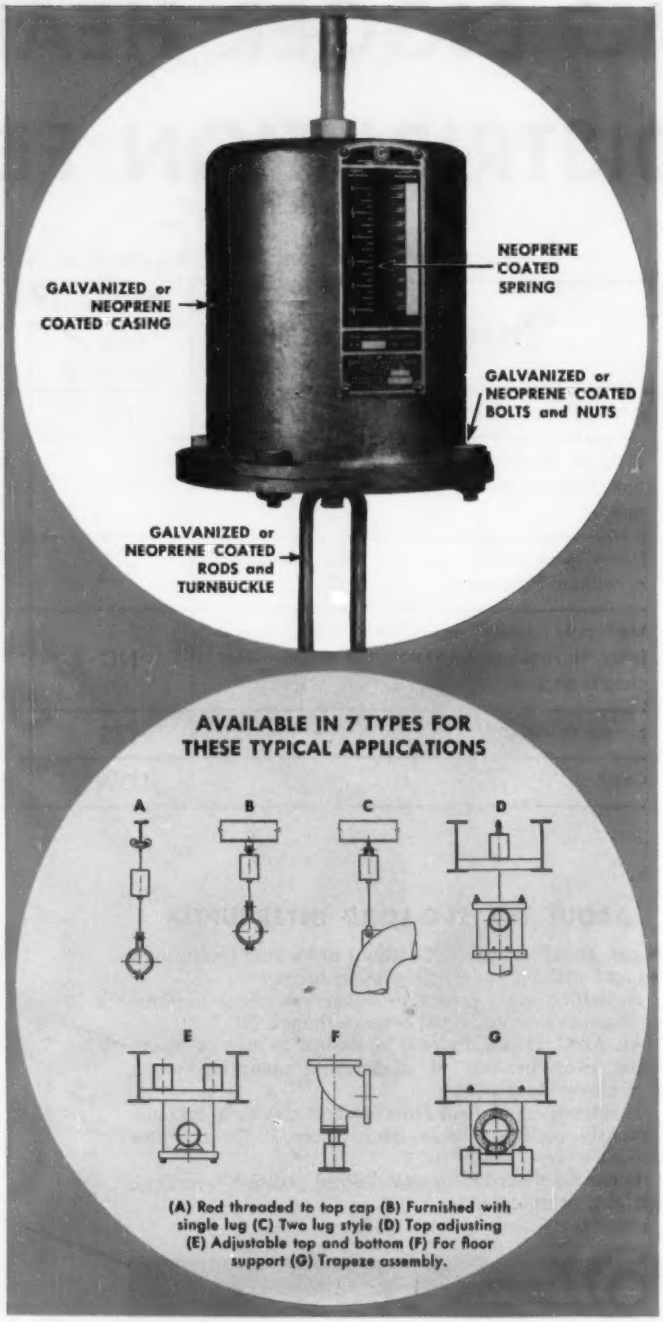


Write today for Catalog Section 760 on S&C Load Interrupters.

NEW

weather-resistant, corrosion-resistant

GRINNELL VARIABLE SPRING HANGERS...


GALVANIZED or NEOPRENE COATED CASING
NEOPRENE COATED SPRING
GALVANIZED or NEOPRENE COATED BOLTS and NUTS
GALVANIZED or NEOPRENE COATED RODS and TURNBUCKLE
AVAILABLE IN 7 TYPES FOR THESE TYPICAL APPLICATIONS
A
B
C
D
E
F
G
(A) Rod threaded to top cap (B) Furnished with single lug (C) Two lug style (D) Top adjusting (E) Adjustable top and bottom (F) For floor support (G) Trapeze assembly.

Another Grinnell First!

Grinnell pre-engineered spring hangers are now offered in two new lines to meet the need for spring hangers in installations subject to highly corrosive industrial conditions and to severe weather exposure.

These hangers are the result of extensive experimentation with various coatings for Grinnell's standard pre-engineered spring hangers. In addition to providing flexibility in pipe suspension, they provide versatility of application through their corrosion-resistant characteristics. They are . . .

1. Neoprene coated — for highly corrosive conditions such as those found in chemical plants and refineries. *All* parts of the hanger are neoprene coated to protect the base metal from a wide range of corrosives. The flex life of the spring is unaffected by the neoprene . . . the coating resists cracking or flaking over a wide temperature range.

2. Galvanized — for outdoor installations where weather conditions are severe. All parts of the hanger are galvanized except the spring, which is neoprene coated to avoid alteration of temper, hydrogen embrittlement and decreased flex-life of the spring — usual hazards to springs from the galvanizing process.

Along with the obvious advantages of such corrosion and weather-resistant characteristics, consider these features...

- Maximum variation in supporting force per ½" of deflection is 10½% of rated capacity — in all sizes.
- Precompression* assures operation of spring within its proper working range, as well as saving valuable erection time. Reduced over-all height saves space.
- 18 sizes available from stock for load ranges from 53 lbs. to 12,000 lbs.
- Available in 3 spring lengths for travel ranges of 1¼, 2½, and 5 inches.
- Installation is simplified by integral load scale and travel indicators.

**Precompression is a patented feature.*

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AMERICA'S #1 SUPPLIER OF PIPE HANGERS AND SUPPORTS

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

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NEW!

T&B complete COLOR KEYED splicing package speeds line and service work

Now one new UT 5 installing tool is the *only* tool you need to make all line and service compression connections . . . including splicers, taps, and pin terminals. And T & B's color-keying insures accurate, speedy connections on a wide range of copper, aluminum and A. C. S. R. cable.
Here's all you do . . . match the color of the die to the color of the connector . . . compress . . . and the joint is made.

Your T & B Distributor will be glad to demonstrate the UT 5 with its many advantages. When you use this one tool you simplify all your line and service work. For further information write for new T & B bulletin.

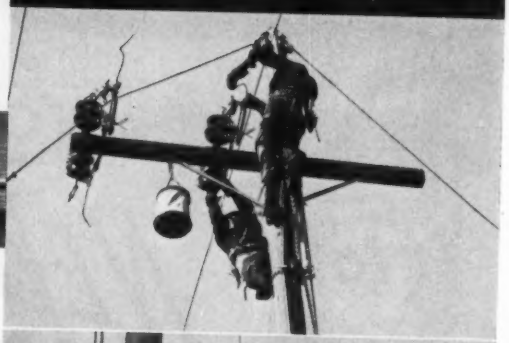
LOOK FOR THIS SIGN — T&B ENGINEERED

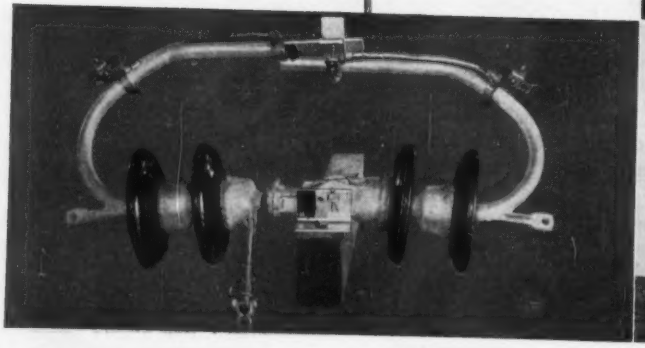
IT'S THE MARK OF AN AUTHORIZED T & B DISTRIBUTOR
The complete line of T&B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs. T-61

THE THOMAS & BETTS CO.

INCORPORATED
14 Butler Street • Elizabeth 1, New Jersey
Thomas & Betts Ltd., Montreal, P.Q., Canada
MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1898

design





simplicity

KPF switches are simple and functional in design. This insures a clean, attractive pole top whether phase units are installed in a triangular, vertical or horizontal configuration.

The simple design of KPF switches also assures operating dependability under all weather conditions. KPF switches have no delicate mechanisms to malfunction, freeze, lock, need lubrication or wear out.

KPF switches have proved themselves in almost 50 years of service on major utilities. Make a test installation. Discover their unique dependability on your own system.

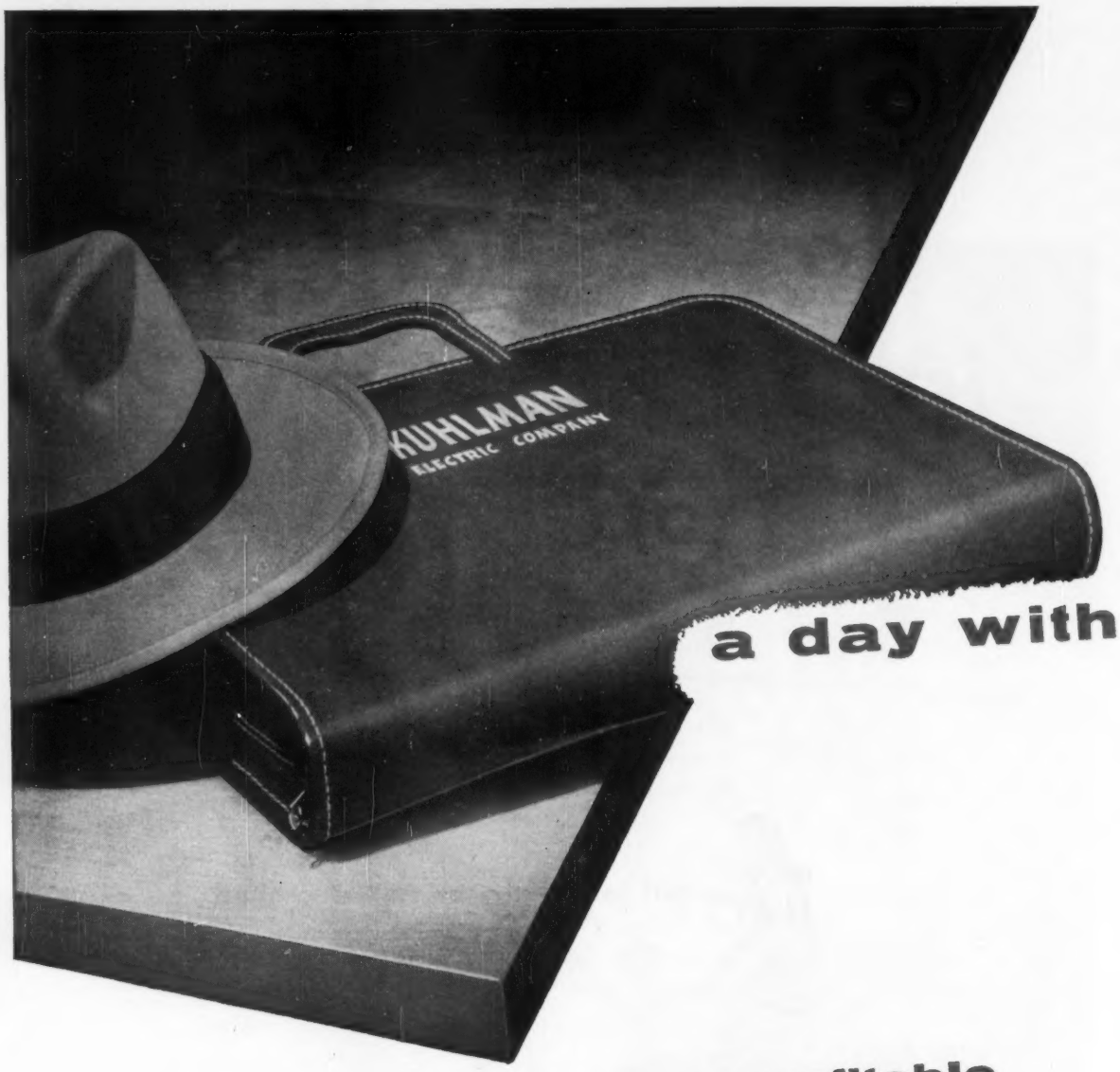
Install in the air—or on the ground

- Top (left)—phase units installed in the air, on previously mounted cross arm.
- Middle—phase units installed on cross arm while on the ground.
- Bottom—phase units and cross arm installed on the ground—pole then tilted into place.

Write direct for catalog

KPF ELECTRIC COMPANY
Dept. E, 1624 E. Alpine Avenue
Stockton 5, California

KPF
AIR BREAK SWITCHES
Standard for nearly half a century



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. . . makes YOUR day more profitable

You stand to benefit several significant ways by the visits of your friendly Kuhlman representative. He brings you the experience of both a highly skilled technician and a successful businessman. He capably represents his company—a pioneering organization that has specialized in manufacturing top-quality transformers for more than 60 years.

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finding the *facts—firsthand*

Your Kuhlman representative likes to look at your problems—firsthand. He'll ask permission to inspect your facilities out on-the-job even though it takes extra time and effort. He knows that field checking assures straight thinking about your particular transformer problems. You'll find your Kuhlman representative coming up with practical, specific ideas that will save money and improve service like no amount of desk-top talk can ever do.

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enlarging your staff—
with specialized skills

Your Kuhlman representative is a successful businessman in his own right. His business judgement is highly valued by his clients and at his parent company. Both his business skill and his technical knowledge can mean money to your organization. Many of his customers look on him as an additional, important man on their staffs. You, too, can use his skills . . . they are at your service whenever you desire.

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Your Kuhlman representative has direct access to the top personnel at headquarters when working on your problems. Without delay, his request sends our top engineering, research and production personnel to work on your problem—right now. With problems and with planning, your Kuhlman representative can be a source of up-to-the-minute ideas . . . a check against current practices in the field . . . a reliable source of product information.

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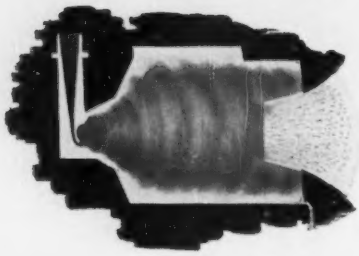
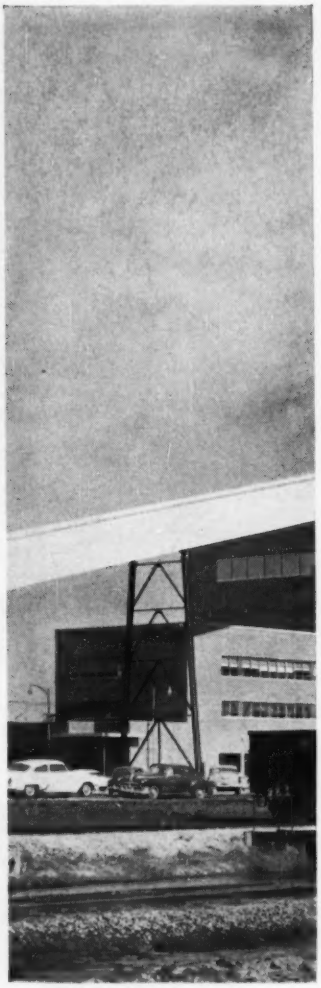
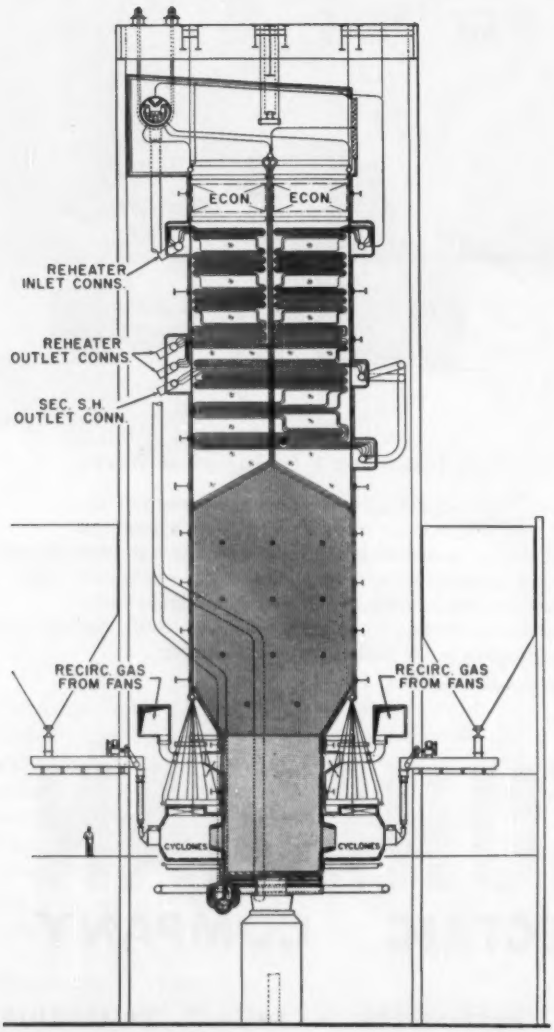
ELECTRIC COMPANY

BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA



CYCLONE FURNACE FOR ST. CLAIR



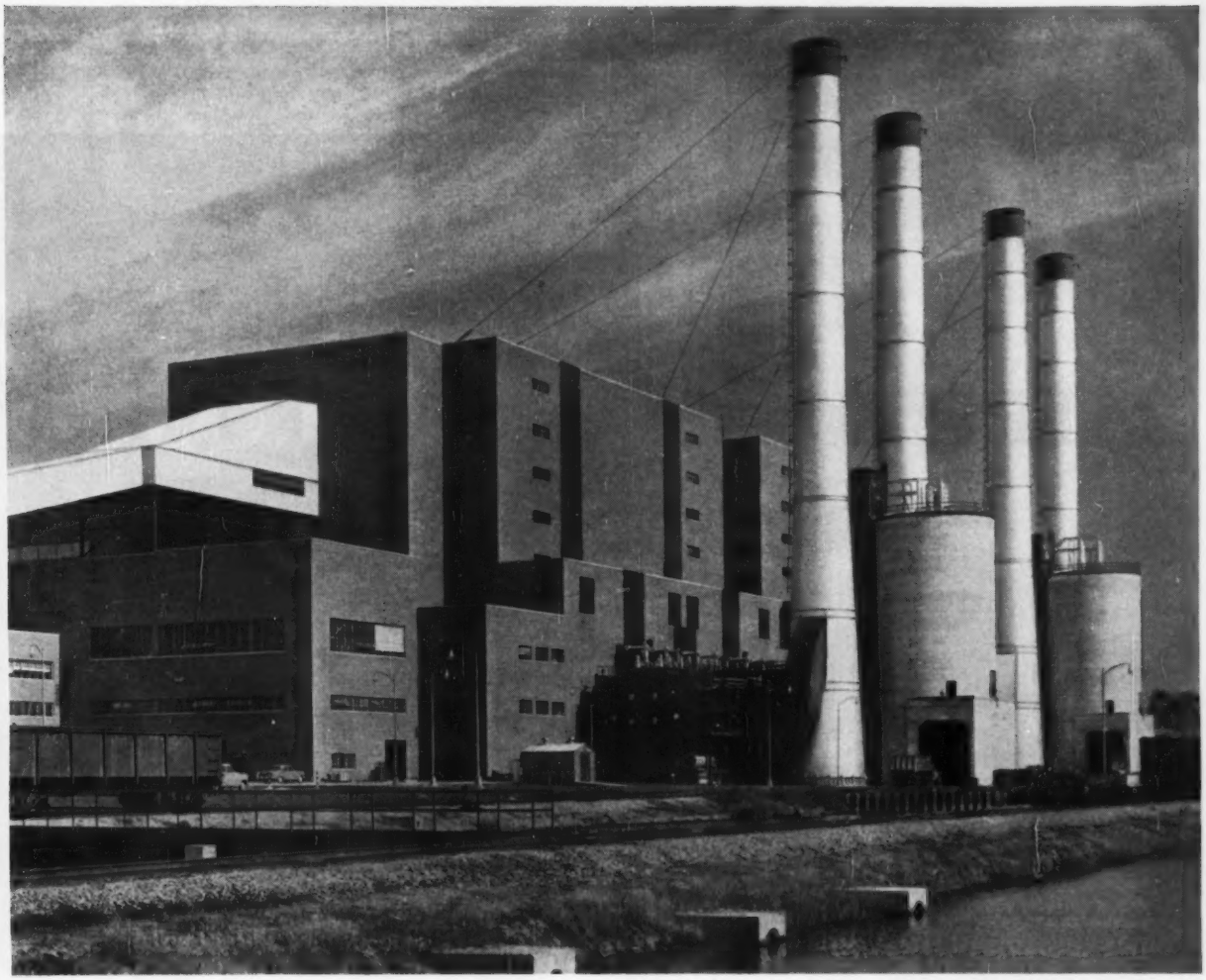


Detroit Edison Company's pioneering of more efficient power generation with better boilers, larger turbines and technical improvements of many kinds takes another step forward with the selection of a Cyclone Furnace-fired B&W Radiant Reheat Boiler for St. Clair Station.

The new generating unit will provide guaranteed capability of 325,000 kw, and the boiler will deliver 2,100,000 lb of steam per hr at 2450 psi and 1050 F at the superheater outlet. Reheat temperature is 1000 F.

ELIMINATION OF HEAVY FLY-ASH DISCHARGE WITH CYCLONE FURNACES

Cyclone Furnace Boilers offer many advantages. One important feature is the elimination of heavy fly-ash discharge from the stack. Most of the ash from the burning coal is melted into easy-to-handle slag right in the Cyclone Furnace. This ash never gets into the gas stream, with the result that dust loading is reduced to very small amounts.



St. Clair Station of Detroit Edison Company. Four B&W units are presently in operation, and a fifth unit—Cyclone Furnace-fired—is now on order.

The Cyclone Furnace offers many other benefits. Through simplification of the entire process of coal preparation, combustion, ash segregation, and ash handling, it makes possible economies in inital cost, operating labor and fuel consumption. Maintenance costs are cut because so much maintenance-causing machinery is eliminated. These are some of the reasons why fifty-six boilers of all sizes are now in operation or on order with a total of over 130 Cyclone Furnaces.

CLEAN STEAM WITH CYCLONE SEPARATORS

Adequate circulation of water throughout the boiler —even at the high design pressure of 2700 psi for the St. Clair unit—is assured with safety by B&W's efficient Cyclone Steam Separators. Located inside the drum, these simple, stationary devices require no power, need no maintenance, do not take up building room. In conjunction with Steam Scrubbers, the Cyclone Separators make it possible to send steam of highest purity to the turbine, contributing to greater turbine efficiency and decreasing the amount of turbine cleaning required.

* * *

These and many other modern advances in combustion and high-pressure, high-temperature steam generation are available to you. We will be glad to discuss them with you in connection with your future plans. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

G-794

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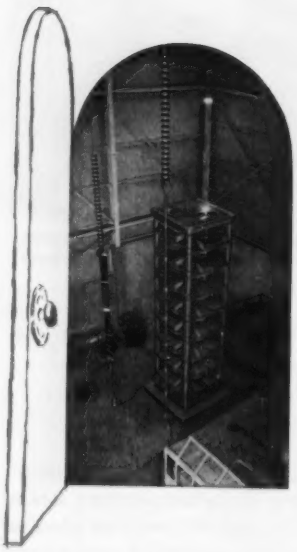
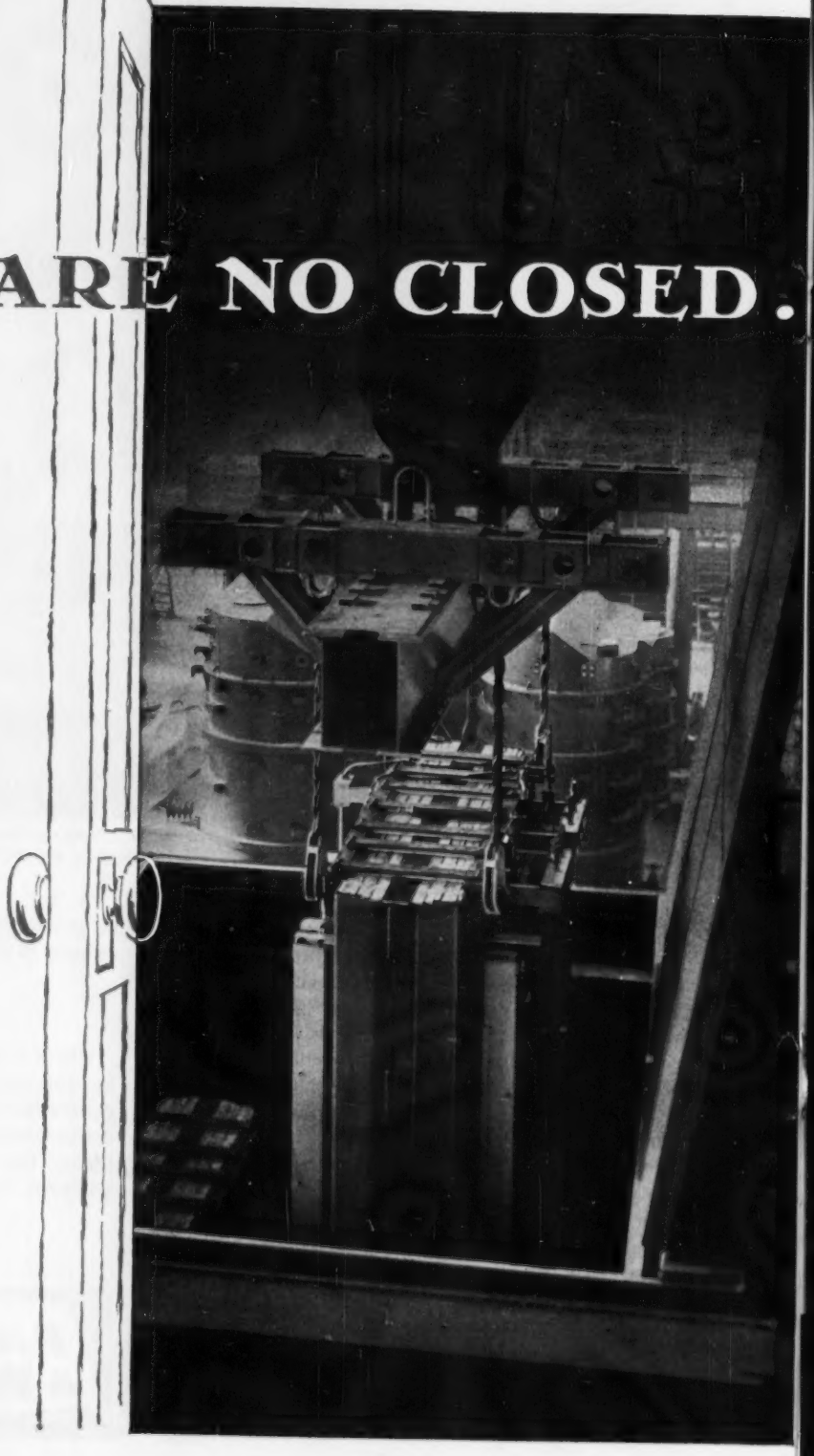
THERE ARE NO CLOSED.

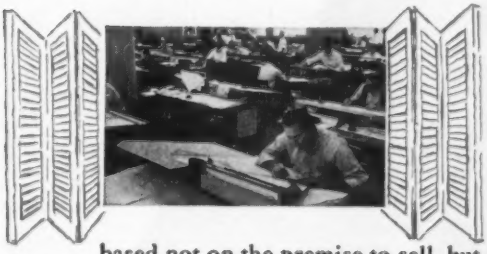




. . . DOORS AT MOLONEY

Moloney's doors are literally never closed to your transformer problems. No matter how trifling . . . no matter how important, Moloney is always pleased to assist, when asked, in helping you solve the transformer problems that frequently occur.

You can depend on Moloney for competent assistance,



based not on the premise to sell, but instead on the preferred premise to render a helping hand . . . backed by 60 years experience in designing and fabricating better transformers.

MEBS-50

Specify Moloney . . . Get Dependability at its Best

MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Load Tap Changing Transformers • Regulating Transformers • Step Voltage Regulators • Primary Unit Substations • Secondary Unit Substation Transformers • Network Transformers • Series Street Lighting Transformers • Subway Transformers Industrial Dry Type Transformers • Capacitors • Magnetic Components for Electronics

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MISSOURI AND TORONTO, ONT., CANADA

NEW MD5 HYTOOL

lightweight champ with a heavyweight punch!

237
239
MD5 HYTOOL Installs Hysplices on #4, #2, 1/0 and 2/0 ACSR
Aluminum up thru 1/0, copper up thru #2 and
Crimpits, Eltaps, Linkits, etc. up thru 1/0

Jaw variations make this the versatile, durable tool you can afford to put on every truck. Low in cost, big in performance this new 4¾ lb. MD5 delivers a 6000 lb. force to install a range of distribution connectors on all conductors through 2/0 ACSR.

It's designed to stand the roughest field treatment. Jaws are of heat treated steel. A set screw adjustment compensates for wear. Die letters or numbers on each groove correspond to connector markings to assure correct crimping. Handle grips color-coded for easy identification.

Your Burndy representative will be glad to demonstrate the advantages of the MD5.

BURNDY

55-14

Norwalk, Connect. • Toronto, Canada • Other Factories: New York, Calif., Toronto • Export: Philips Export Corp.

ELECTRICAL BUSINESS OUTLOOK

Electrical World
AUGUST 20, 1956

Oil prices are in a precarious position as a result of mid-east tension over the Suez. With Western Europe depending on Suez traffic for the bulk of its crude oil, any interruption of this supply will bring . . .

Higher prices on crude oil both here and abroad. With European buyers clamoring for American crude, U. S. producers will be quick to seize the opportunity to raise prices. They have been hesitating for some months now—mostly because gasoline stocks have been unusually high for this time of year. Now the Suez situation is in a position to turn this oversupply into a shortage almost overnight.

• • •

Domestic copper prices should hold firm despite recent sharp price fluctuations on the London Metals Exchange. The Suez scare has much to do with the London prices. Basically though, the reason is that most European fabricators have kept inventories rather low over the past year. Here at home the story is different. Fabricators (who are now moving only about 75% of the finished products they shipped in the first quarter) are sitting on pretty healthy inventories built up earlier in the year. So even if demand for finished products takes a big jump, present refined stocks will go a long way.

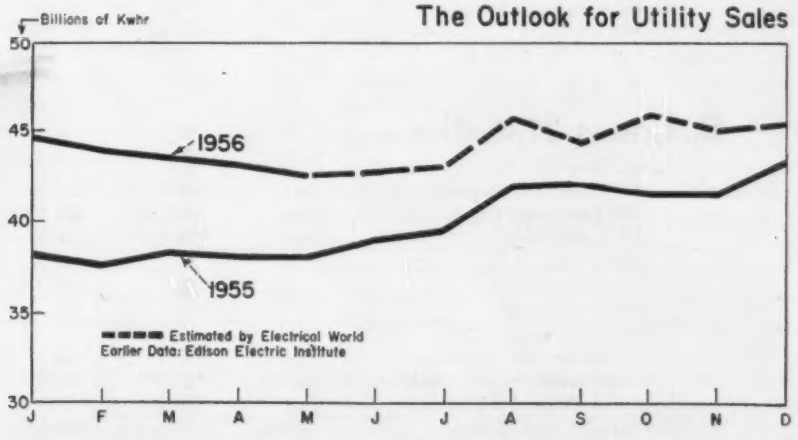
Don't expect the latest round of steel price hikes to set the pattern for very long. Most observers figure the $8.50 a ton average price increase just about covers steel producer's direct cost increases stemming from the new three year wage contract. It doesn't leave much room for higher prices the industry will pay for coal, scrap, fabricated steel and everything else steel buys. And these are certain to go up once the effect of the steel price increase has made the rounds.

• • •

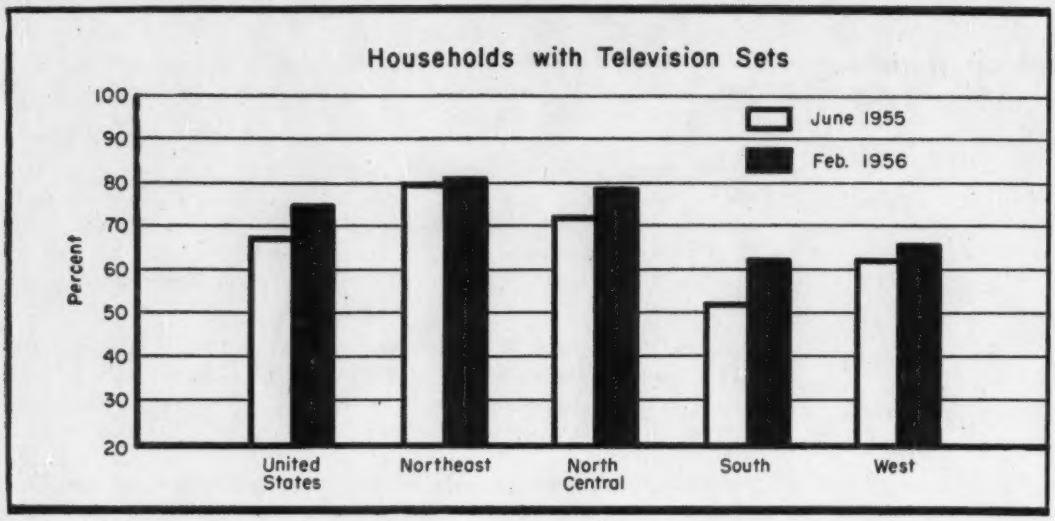
Steel prices will have to go up again if only to provide capital for the industry's big expansion program. Present prices won't do this and still give stockholders a fair return on their investment. When you add this to higher costs you can see prices going up again at almost any moment.

Total electric energy sales for 1956 (chart below) won't be affected one way or another by the month long steel strike. Top-heavy steel inventories before the strike would have forced sharp production cuts for the rest of the year. Now, with consumers inventories considerably reduced, steel mills are expected to operate near 100% capacity for the remainder of the year.

The Outlook for Utility Sales



STATISTICS



Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	May	117.43	116.78	106.32	10.4
Peak—Class 1 Systems. } million kw	June	97.00	92.6	86.6	12.0
Estimated Dec. '56 Peak	May	106.00	105.88	103.44	2.5
Production—billion kwhr	May	49.09	47.49	43.35	13.2
Hydro		11.70	11.55	9.81	19.3
Fuel		37.39	35.94	33.54	11.5
Sales—billion kwhr	May	44.18	44.51	39.49	11.8
Residential		11.02	11.82	9.76	12.9
Commercial		6.74	6.70	6.17	9.2
Industrial		24.04	23.53	21.25	13.1
Other		2.38	2.46	2.32	2.6
Fuel Consumption	May				
Coal—million tons		12.05	11.95	10.76	12.0
Oil—million barrels		4.47	5.76	4.88	−8.4
Gas—billion cu. ft.		110.51	89.72	103.43	6.8
Net Income Class A & B Co's—$ million	May	103.15	115.46	92.7	11.3
Residential Customers—millions	12 mos.	44.76	44.67	43.51	2.9
Revenue per kwhr	ended	2.62¢	2.63¢	2.67¢	−1.9
Avg kwhr per customer	April 30	2,838	2,819	2,623	8.2
Avg annual bill		$74.36	$74.12	$70.01	6.2

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	June	141	141	139	1.4
ENR Construction Cost	Aug.	156	145.6	140.9	3.6
BLS Cost-of-living	June	116.2	115.4	114.4	1.6
NEMA Sales	May				
Insulation materials		158	163	154	2.6
Electric appliances		103	111	108	−4.6
Wholesale prices	May				
Motors and generators		132.1	130.4	120.8	9.4
Transformers and regulators		137.5	135.3	127.3	8.0
Switchgear and fuses		151.2	149.0	135.6	11.5
GNP—annual rate—$ billion	1st Qtr.	398.5	397.3	375.3	6.2

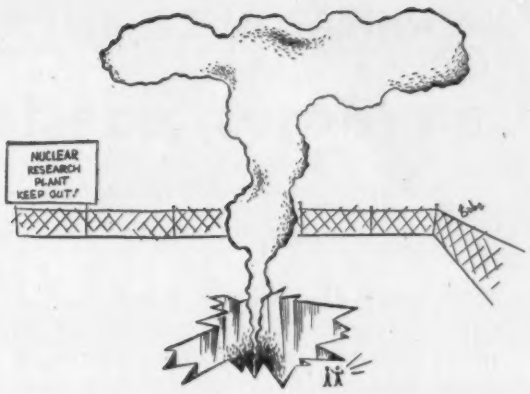
Your Business

Midsummer brings out the lighter side of our business. Across our desk during the past few weeks have come such illuminating notes as these:

Wash day troubles. A tidy woman at Carolina Beach, N. C., washed her dress, hung it outside the apartment window to dry. An ocean breeze blew it across a nearby transformer shorting out the town's power supply for an hour. The dress went whiff—hasn't been seen since.

Even Money. New air conditioning equipment in the Turkish official engraving plant assures much more uniform currency for that Republic. Before the installation, the bank notes came out smudged and fuzzy when the outside temperature varied from 72 degrees or the relative humidity went much above 55%.

Pressurized shopping. When clerks of a variety store in New York went home without turning off the air conditioning system, windows and doors started bulging. Firemen summoned to investigate faced a frigid gale when they succeeded in breaking in a side door. The churning intake fan had built pressure inside the store.



. . . "Did you ever have one of those days when everything seems to go wrong?"

Downright lucky. When a scaffold let go inside a power station stack, Leeds, England, Steeplejack John Hayturst tumbled 200 feet, bruised his shoulder slightly.

Your Health—Carbon Monoxide Poisoning

REX H. WILSON, MD, Medical Director, B. F. Goodrich Co

You can "end it all" by inhaling the carbon monoxide exhaust fumes from an automobile.

Carbon monoxide is a non-irritating, tasteless gas with a faint garlic-like odor. When you breathe it in, carbon monoxide combines with the blood and is transported to all of the body cells. Ordinarily the blood carries oxygen. When oxygen is replaced by carbon monoxide the cells cease to function.

Dangerous concentrations of the gas may be present in burning buildings. The threat of carbon monoxide is present wherever gasoline or diesel engines are operated in closed quarters. Auto exhaust fumes contain about 7% carbon monoxide.

Carbon monoxide is a hazard in many occupations. Coal dust explosions in mines fill the air with poisonous carbon monoxide. Illuminating gas may contain up to 30% carbon monoxide. If the gas escapes combustion a hazard is present. Smoke from burning coal contains about 16% carbon monoxide. Back drafts, cracks or leaks in burning chambers and flues may create poisonous atmospheres.

A concentration of 0.02% carbon monoxide in the air produces headache, dizziness, nausea and vomiting in three hours. As the concentration increases, confusion, difficulty in breathing, impaired judgement and tiredness occur. The skin shows irregular red blotches and blueness. The pulse is weak and rapid. Consciousness is usually lost when carbon monoxide levels in the blood reach 40 to 50%.

The overcome person must be removed to fresh air immediately. The best treatment is to give oxygen. The patient must be forced, if necessary, to breathe.

Oxygen should be administered about an hour for each ten minutes of unconsciousness. Any person affected by carbon monoxide should be kept from work for at least 4 hours. If he has been unconscious he should rest at least 24 hours before returning to work. If unconsciousness lasts for 15 minutes after treatment has been started, he should be hospitalized. If coma lasts for 24 hours the outcome usually is fatal.

Fortunately, most persons recover without residual effects. If acute poisoning is severe and prolonged, chronic nerve and mental changes occur.

There are many guardians of our health and well-being. The best guardian you have is yourself. Carbon monoxide fumes are abundant in our modern age. There really is no excuse for not taking every precaution against this highly toxic substance. Remember, even breathing can be dangerous. There is nothing better for you than fresh air.

WASHINGTON COMMENT

Can Moses Sidestep Congress?

Washington looks favorably on New York State's proposal to get a license for Niagara from FPC and test authority of Congress in a court battle

V. CRAIG RICHTER, Washington Correspondent

New York State Power Authority's intention of seeking to resolve the Niagara problem by applying for a Federal Power Commission license generally is looked upon favorably in Washington.

After a record of six years of failure by Congress to act on this matter, most officials here believe another answer had to be found. The FPC route is a logical one.

It is the estimate of officials here that the Niagara issue will remain deadlocked in Congress as long as New York State itself is split on the question.

There are, of course, a number of facets to the controversy. But according to officials here, in the final analysis it boiled down to something like this:

Legislators from other parts of the country, the West, Midwest, and Southwest, contend that when they come to Congress with a project for their states, they are all—Republicans and Democrats—agreed on the need for that project. But here are the New York legislators split wide open on the Niagara project. Some say the people of New York want one thing, some say another. How can these non-New York legislators then support something when there is no agreement in the state itself as to what is wanted?

The officials who make this analysis of the picture see little chance of the New York delegation—and Congress—voting a Niagara bill next year or any time in the foreseeable future.

Litigation is implicit in the proposed power authority application for an FPC license. If FPC gets the chance and should turn down the application, the Power Authority would undoubtedly take the matter to court. If FPC approves the application, no doubt some intervening group will resort to court action. In the latter case, the identity of the intervenors will depend on whether preference is incorporated in the license application.

This court action would be a test of the validity of a Senate reservation in the 1950 Niagara treaty. This clause reserves to Congress the right to determine by whom and how the Niagara redevelopment shall be undertaken.

Two Columbia University lawyers have already furnished the Power Authority Chairman Robert Moses with an opinion to the effect that the Senate clause is not valid.

Most Washington experts won't commit themselves on this touchy subject. But it is noted that FPC has granted licenses in such cases as the St. Lawrence River and the controversial Hells Canyon project.

One official says FPC "would examine the legal implications very critically before rejecting the application."

This official stresses the words "before rejecting", rather than "before approving." It might be assumed, therefore, that FPC would be very sure of its legal ground if it granted a license to the New York Power Authority.

In any event, the outlook for Niagara redevelopment finally is one of action rather than prolonged debate.

TECHNICAL NOTES

Polytetrafluoroethylene offers qualities attractive for conductor insulation. It withstands 250C for long periods in air yet remains flexible at —75C. Water absorption is very low and the insulation surface is tough and durable.

Gamma rays from radioactive isotopes are expected to kill or sterilize wood-boring insects.

Atmospheric contamination of lightning arresters can distort voltage distribution on stock units enough to cause failure.

Power stations exposed to salt spray at the seacoast may attain lower production cost with indoor construction to retard corrosion. A record of prolonged and heavy rains also merits consideration.

Precise determination of maximum 60-cps voltage at a lightning arrester location permits matching the arrester rating closer to its duty to provide better protection for nearby equipment.

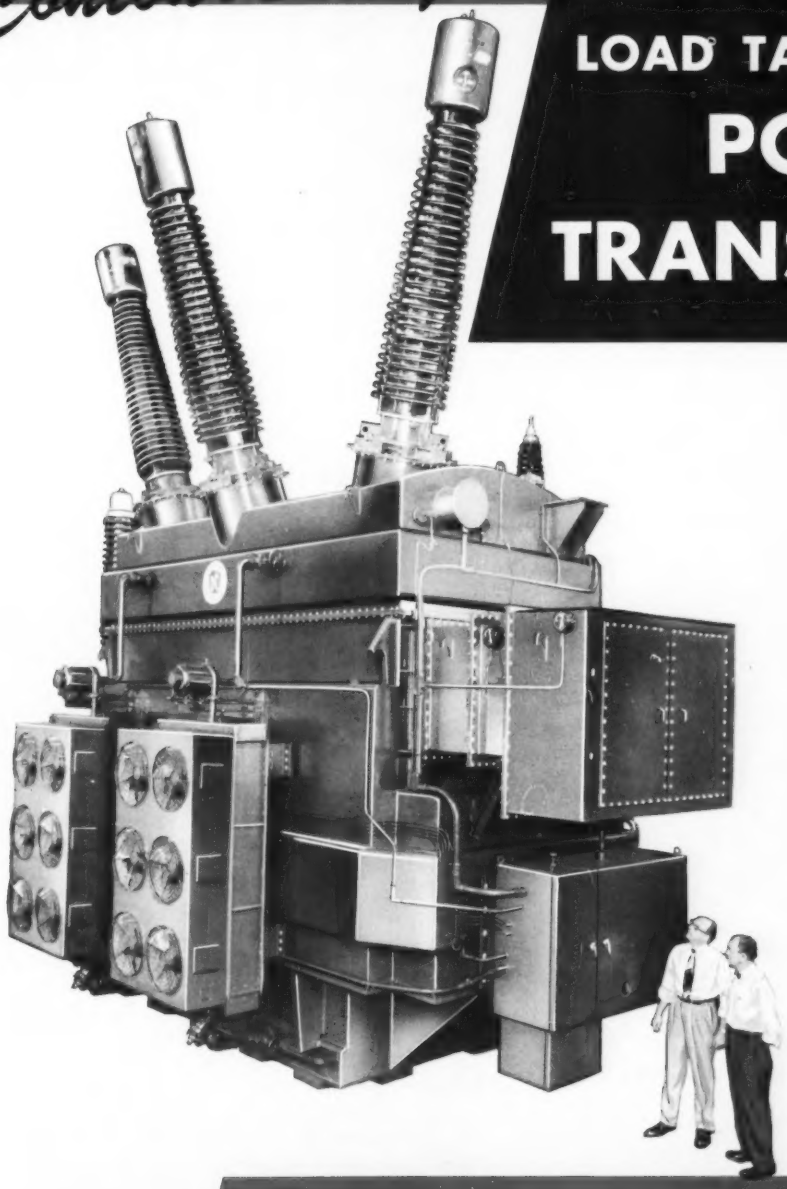
Substation main buses on one level contribute to reliability and working safety.

100,000 Kva, 330 Kv

THREE PHASE.....

Contour Design

PENNSYLVANIA LOAD TAP CHANGING POWER TRANSFORMER



The efficiency and compactness of Pennsylvania's shell-form Contour Design were "made to order" for this 100,000 kva, 330 kv transformer — one of the largest ever built from the standpoint of voltage. The unit will step down a transmission-line voltage of 330,000 volts to the 14,400 volts required for plant distribution. Its features include corona-free high-voltage coils with uniform impulse voltage distribution . . . and Pennsylvania's new high-capacity load tap changing equipment, designed for applications through 150,000 kva. The forced-oil cooling system has four oil-to-air heat exchangers.

pt

PENNSYLVANIA TRANSFORMER COMPANY

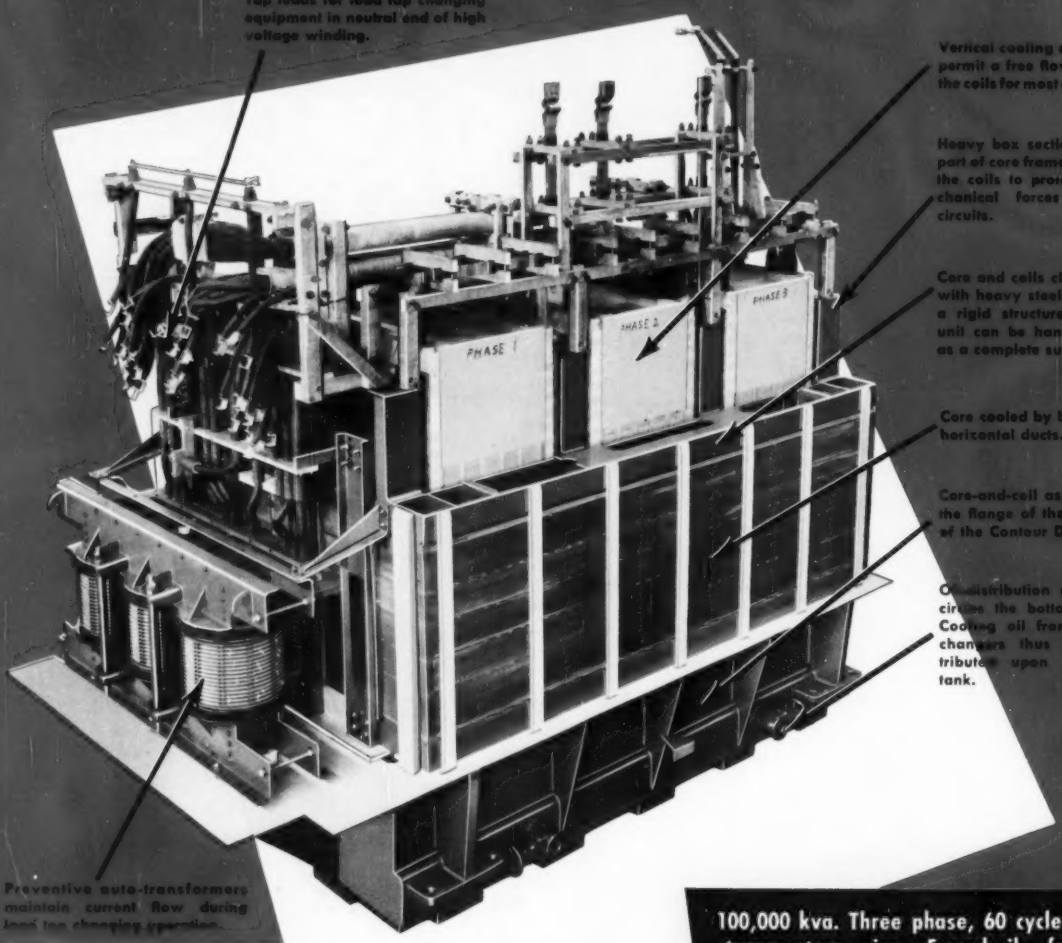
A McGraw Electric Company Division

CANONSBURG, PENNSYLVANIA • *Greater Pittsburgh District*

see next page for inside story

inside a
100,000 Kva, 330 Kv

THREE PHASE *Contour Design* PENNSYLVANIA LOAD TAP CHANGING
POWER TRANSFORMER



Tap leads for load tap changing equipment in neutral end of high voltage winding.

Vertical cooling ducts in the coils permit a free flow of oil through the coils for most efficient cooling.

Heavy box sections which form part of core frame securely clamp the coils to protect against mechanical forces during short circuits.

Core and coils clamped together with heavy steel frames to form a rigid structure. Core-and-coil unit can be handled separately as a complete sub-assembly.

Core cooled by both vertical and horizontal ducts.

Core-and-coil assembly rests on the flange of the bottom section of the Contour Design tank.

Oil distribution duct completely circles the bottom of the tank. Cooling oil from the heat exchangers thus is evenly distributed upon re-entering the tank.

Preventive auto-transformers maintain current flow during load tap changing operation.

100,000 kva. Three phase, 60 cycles, 55° C. temperature rise. Forced-oil, forced-air cooled. High voltage: 330,000 Grd. Y volts. Low voltage: 14,400△ volts. Load tap changing equipment for ± 10% regulation in 32 steps of ⅝%.

PENNSYLVANIA TRANSFORMER COMPANY

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For external view, see other side.

RCA Microwave antenna at Grace, with mountainous terrain at Oneida viewed in background.

Utah Power & Light Company Expands Load Control System and Reduces Maintenance

. . . with reliable RCA Microwave

When requirements for a new load control system at Utah Power & Light were determined, the need for considerable expansion of communications became apparent.

After careful analysis it was found that, by combining CW-20A RCA Microwave, powerline carrier and wireline facilities, a highly workable system would be possible. Among economies, this saved the cost of rebuilding company telephone lines to bring them up to standards suitable for telemetering service and obviated the use of open-wire telephone circuits.

Mr. J. S. Hooper, Communications Supervisor, says, "RCA Microwave provides a consistently dependable central backbone system where circuit requirements are greatest. Many of the voice circuits on the microwave system are connected directly to wireline circuits and telephone line carrier circuits, extending them to offices and substations between microwave repeaters. Thus it has been possible to reduce the wireline system by approximately 70%, also greatly reducing the communications maintenance on the system."

Provision for the addition of future channels makes RCA Microwave an inexpensive form of communication per channel mile. Equipment utilizes easy-to-service familiar circuits and conventional tubes. Single sideband suppressed carrier frequency division multiplexing is used exclusively to meet high standards of dependability. Frequency is controlled only from the terminals through the entire system. Furthermore, RCA makes available the nation-wide service of the RCA Service Company to keep entire system operating at its peak.

RCA Microwave Specialists will be glad to answer any questions and help plan your installation. Mail coupon for further particulars on use of Microwave in utilities, pipelines, turnpike and other applications.

RCA MICROWAVE

POINT-TO-POINT COMMUNICATION

RADIO CORPORATION of AMERICA

COMMUNICATIONS PRODUCTS

CAMDEN, N. J.

Radio Corporation of America
Communications Products
Dept. HC-45, Building 15-1, Camden, N. J.

☐ Please send me latest literature on RCA Microwave

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

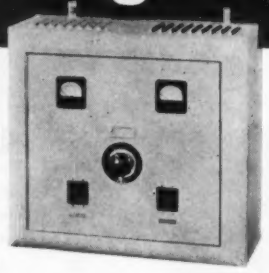
CITY _____ ZONE _____ STATE _____

☐ Have an RCA Representative get in touch with me.

standby power...just sleeping...not dead

Yes, it's mighty quiet in most battery rooms, but if service continuity is to be maintained, every cell must be ready *at all times* to spring to immediate action. For dependable switchgear operation . . . and for railway signalling, alarms, communication equipment and the other applications where *positive performance* of storage batteries is vital . . . more and more utilities and industries are finding that INET-Palmer *Regulated* Battery Chargers are the best form of insurance. And, one of the least expensive. Completely unattended, they guard batteries against sulfation and discharge . . . make sure *24 hours a day* that standby power, on those rare occasions when it's needed, is always ready.

regulated battery chargers



6 reasons why INET-Palmer regulated chargers are your BEST BUY...

COMPLETELY AUTOMATIC . . . operates unattended; no operator required.

DEPENDABLE . . . no moving parts or vacuum tubes used in circuits.

STABLE . . . less than ±1% variation from no-load to full-load despite ±10% *simultaneous* input variation.

EASY INSTALLATION . . . floor, wall, or panel models available.

WIDE RATING RANGE . . . 3 to 60 cells in ratings to 50 KW.

LOW OPERATING COST . . . nothing to wear out, nothing to maintain.

Send today for Bulletin T-1100 containing complete specifications.

LEACH CORPORATION | INET-PALMER DIVISION

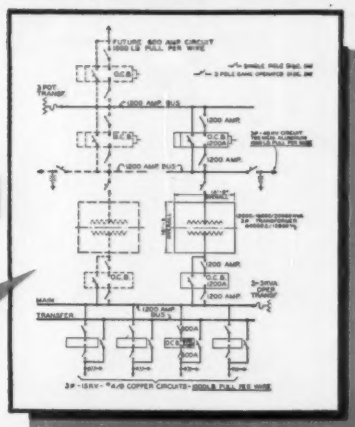
4441 SOUTH SANTA FE AVENUE • LOS ANGELES 58, CALIFORNIA

DISTRICT OFFICES AND REPRESENTATIVES IN PRINCIPAL CITIES OF U. S. AND CANADA

HOW SAVANNAH ELECTRIC AND POWER COMPANY SAVED TIME AND MONEY ON NEW SUBSTATION

Southern States' Easy 3-Step Plan Eliminated Headaches and Problems of Both Design and Production

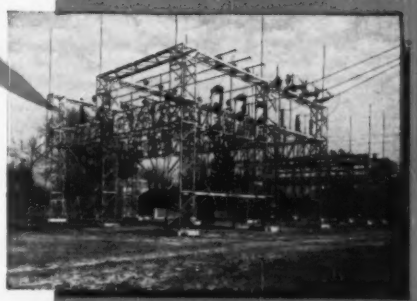
Here is how progressive, forward-looking Savannah Electric and Power Company obtained its Boulevard Substation in rapid order at substantial savings in both time and money:



STEP 1 Utility's engineers made this one-line diagram with basic specifications.

STEP 2 From these, Southern States' engineers developed complete plans, details and specifications for a substation that met immediate needs and provided for future load growth in fast-growing Savannah.

STEP 3 Upon approval, Southern States completed the station—took care of engineering, production, schedules; supplied the steel structure, air break switches, disconnects and bus supports.



Savannah, Georgia—46 kv—7.96/13.8 kv substation with 4 low-voltage circuits, three 46 kv circuits (1200 amp switches), main and transfer bus on low voltage. Low voltage bank breaker with by-pass (1200 amp switches). Present transformer bank capacity: 20,000 kva; future bank addition, 20,000 kva.

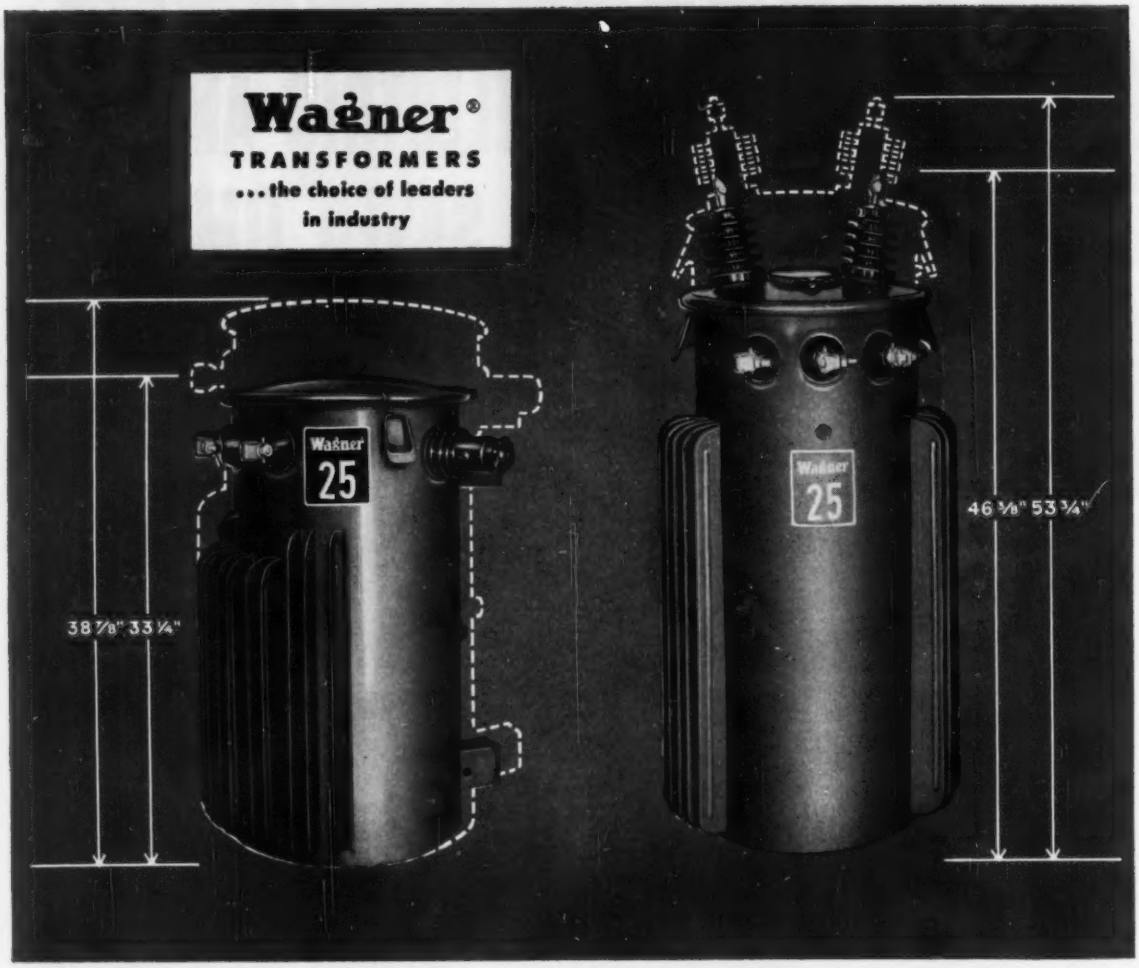
THE RESULT: An efficient, functional substation erected with a minimum of fuss and bother and at accountable savings to Savannah Electric and Power Company.

Your company, like utilities coast to coast, can capitalize on Southern States' "3-Step Plan" for distribution and transmission substations. Get the facts from your Southern States representative, or write direct for full information.

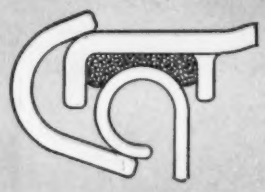
SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA:
Dominion Cutout Co., Ltd., Toronto

Wagner®
TRANSFORMERS
...the choice of leaders in industry



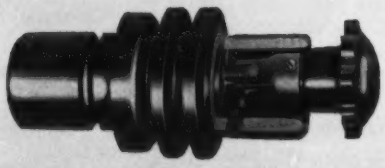
SHUR-SEAL CLAMPING RING



Keeps transformer sealed air-tight... no atmospheric moisture or dust particles can get inside. Spring action of lip and ring maintain pressure on gasket. Cover may be removed by loosening a single bolt.

HIGH VOLTAGE SIDEWALL BUSHING

For use with either copper or aluminum conductor... safety-designed for faster, easier connections, without tools. Porcelain and terminal are locked in position.



MECHANICAL FEATURES

The rating of each of these new transformers is clearly shown on the tank. There are fewer sharp edges and brackets on the tank where rust can start ... lifting lugs are curved and rounded.

In the 25, 37½ and 50 Kva ratings, cooling fins increase the radiating surface. The 75, 100 and 167 Kva ratings are provided with tubes.

Wagner

Distribution Transformers

smaller-lighter-easier to handle and install

Now Wagner Form W Distribution Transformers are substantially smaller and lighter than ever before... up to 25% shorter in the important overall height dimension—17% lighter in weight. Yet they are liberally designed for excellent electrical performance.

This means greater ease of handling—speedier installation. It also means that you can save money by putting greater transformer capacity on your existing structures... handle heavier loads without installing new poles. All these new Form W Transformers, in ratings 15 through 167 Kva, 15 KV and below, can be pole mounted.

Such reductions in size and weight are made possible by improvements in core and coil construction. A special resin coated insulating material is used for layer, channel and barrier insulation. Heat treating bonds this insulation to the coil conductors to give the coils exceptionally high mechanical and electrical strength.

These new, lighter shorter Form W Transformers will meet your distribution requirements. Consult the Wagner Sales Engineer in your area for complete information.

LOCKED LOW VOLTAGE BUSHING

The bushing and terminal are key-locked to prevent rotation... no loose terminal connections to cause internal shorts. Suitable for copper or aluminum conductor.

INHIBITED OIL

—reduces oxidation to a minimum... retards formation of acids and sludge.

Wagner Electric Corporation EST. 1891

WAGNER ELECTRIC CORPORATION
6456 Plymouth Ave. • St. Louis 14, Mo., U. S. A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

T56-12

No question of responsibility with

Lapp INDOOR SWITCH AND BUS SUPPORTS

Lapp BACK-CONNECTED BUSHINGS

RATING, Kv		2.5	5	7.5	15L	15H	23	34.5
1.5 x 40 withstand, Kv		45	60	75	95	110	150	200
60 ~ withstand, Kv		15	19	26	36	50	60	80
CLASS A	A-10	X	X	X				
	A-20		X	X	X	X		
	A-30		X	X	X	X	X	
CLASS B	B-20		X	X	X	X		
	B-30			X	X	X	X	X
	B-40			X	X	X	X	X
	B-50			X	X	X	X	X
CLASS D	D-20			X	X	X		
	D-30			X	X	X	X	X
	D-40			X	X	X	X	X
	D-50			X	X	X	X	X

Throughout the range of NEMA standards (SG6-6.06) . . . in three design types, in five strength groups, and in voltage ratings 2500 to 34,500 . . . Lapp Indoor Bus Supports and Lapp Back-Connected Switch Bushings are *matching* series. They match in heights, diameters, strengths, and electrical characteristics.

But, in specifying Lapp bus supports and back-connected bushings, you gain more than the convenience and economy of interchangeability. Yours also is the assurance of single responsibility for performance of porcelain, metal parts and complete insulator assembly. And Lapp responsibility always means an extra margin of operating security, low upkeep and long life.

Available as standard or on specification from all leading switch manufacturers.

◀ Lapp Indoor Switch and Bus Supports and Lapp Back-connected Bushings are available as catalog items in matching voltage ratings, strength groups and design classes as indicated at left.

Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp

The most beautiful money in the world...
is made for you by Honeylite !

HONEYLITE *combines maximum efficiency with maximum beauty.*

HONEYLITE *is easier to install.*

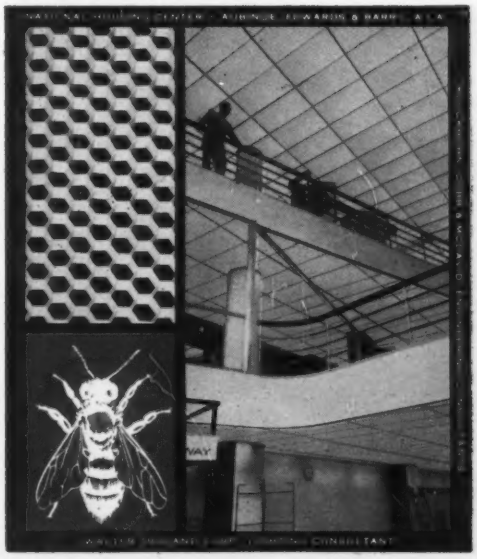
HONEYLITE *is suitable for every application. UL approved.*

Used in full ceiling lighting, in recessed troffers and in all types of lighting fixtures, HONEYLITE transmits the most light with the lowest surface brightness.

HONEYLITE may be used in all types of T-bar suspension systems. Because of its low weight (2 oz. per sq. ft.) and inherent acoustical properties, HONEYLITE requires a far less complicated suspension system than any other light diffusing material.

HONEYLITE can be incorporated in any lighting installation — suspended louvreall ceilings, troffer diffusers, industrial and commercial fixtures.

For price lists and detailed information see your local distributor or write to Dept. EC, Hexcel Products, Inc., 951-61st Street, Oakland 8, California.



HONEYLITE

LIGHT-DIFFUSING ALUMINUM HONEYCOMB

A development of **HEXCEL PRODUCTS INC.**

"When you're as old as me, sonny,
this meter will still be working!"

Tom Barnes, Mgr. Meter Engineering, Says:
"WE ARE CERTAIN THAT LOAD GROWTH WILL NEVER MAKE THIS METER OBSOLETE."

The New Westinghouse 30-Ampere Meter

Good news! For only pennies a year over the cost of ordinary meters, you can buy the new 30-ampere Westinghouse Lifetime Meter. It's good insurance against load-growth problems. This new meter will handle all single-phase loads up to 200 amperes.

Few homes *today* require 200-ampere meters. But how about the future? Industry forecasts predict a tremendous growth in the use of electric power, particularly in the home.

The 30-ampere meter gives you a substantial cushion against this future load growth. It is your guarantee that whatever the future, your meters will have the capacity to handle the load.

In most localities, testing requirements are the same as for 15-ampere meters. For only a little more, you get twice the metering capacity when you specify 30-ampere Lifetime Meters.

For more information, see your Westinghouse sales engineer or write Westinghouse Electric Corporation, 3 Gateway Center, P.O. Box 868, Pittsburgh 30, Pa.

J-40489

New 30-ampere meter gives you all the Lifetime features

10,000-volt impulse insulation level in current and potential coils. De-ion® gap discharges outside the meter at 6500-volt impulse for lightning protection. Corrosion resistance in all components. Full and light-load adjusters are linear, 20% range, accessible from the front.

Alnico damping magnets for extreme stability. Famous Westinghouse ball-and-jewel bearing, a proved Lifetime bearing.

WATCH WESTINGHOUSE

*WHERE THE **FUTURE** IS **ALREADY** IN PRODUCTION!*

Savannah Electric and Power Reports:

TROUBLE-FREE COMMUNICATIONS FOR FOUR YEARS WITH GENERAL ELECTRIC TWO-WAY RADIO

For the past four years, the Savannah Electric and Power Company has depended upon trouble-free G-E two-way radio to coordinate maintenance, transmission, and construction crews throughout a five-county, fifty-mile city radius.

General P. E. Seawright, Superintendent of Transmission and Distribution for Savannah Electric and Power, reports his organization has never experienced a serious break in two-way radio communications, during four years of operation. He credits General Electric's dependable equipment, teamed with a maintenance program provided by the local General Electric Authorized Service Station, for assuring his firm of full 24-hour radio services.

Radio Cuts Service Loss Time

Seventeen mobile units in the fleet of service and supervisory vehicles are coordinated by radio from the office of General Seawright, in the Savannah office.

General Seawright credits the G-E two-way radio system for speedy assists in the restoration of service in emergencies. This is a vital factor to the thousands of homes and commercial installations over 1000 miles of line.

New Progress Line Radio

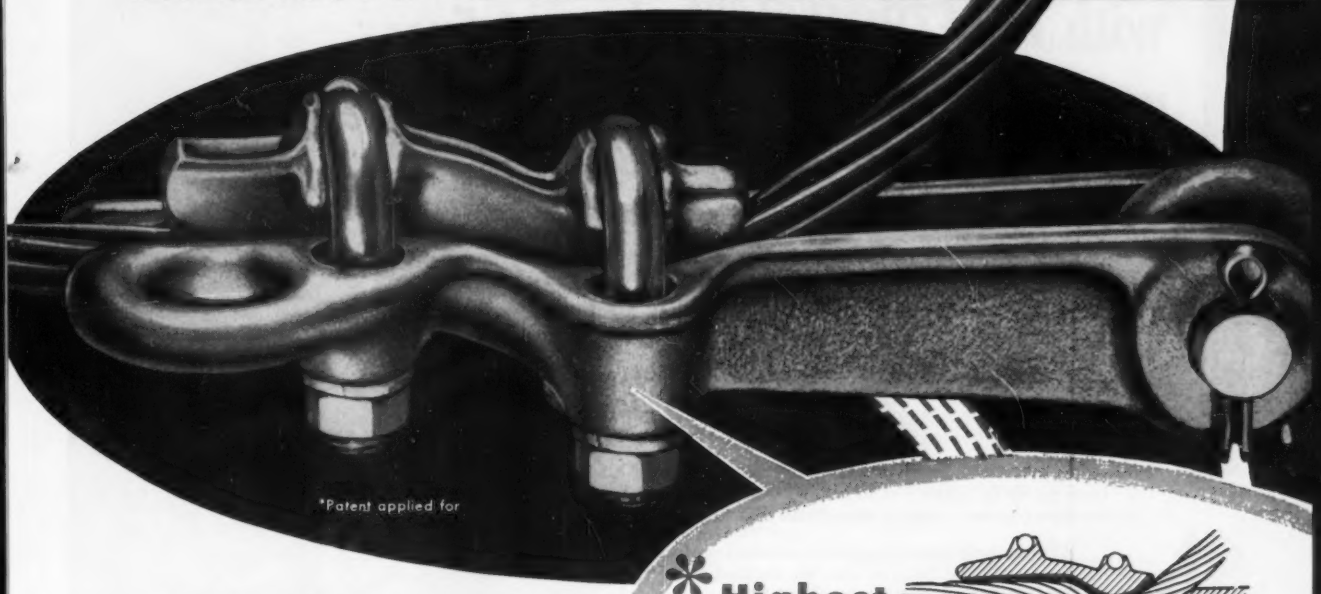
General Electric's new Progress Line radio provides full chassis, interchangeability, plug-in chassis, and new 6600 series tubes, specially designed and tested for radio communication circuits.

Your Communications Counselor can give you full details. Call him in, or, write: *General Electric Co., Communication Equipment, Section X1986-20, Electronics Park, Syracuse, N. Y.* In Canada, write: *C.G.E. Electronics, 830 Lansdowne Avenue, Toronto.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

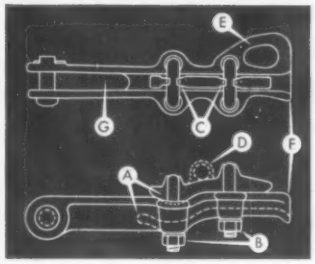
Anderson's New, Exclusive* SNUB SEAT



*Patent applied for

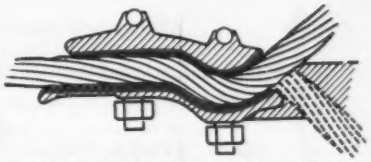
Type ADE straight dead end clamp

Here is the finest straight line clamp money can buy . . . *with greater holding power and more outstanding "working" features than any other comparable clamp on the market today!*



They're built for long, trouble-free service. (A) The body and keeper are high strength cast #356 aluminum alloy, heat treated. (B) Conductor can be inserted through clamp without removal of nuts. (C) U-bolts peened to unit keeper to facilitate ease of hot-line work. This *one-piece* assembly of U-bolt and keeper distributes pressure over large area and prevents damage to cable. No liners are required. (D) "Lifting" eye optional for use in hot line work. (E) "Come-along" eye for ease of sagging cable. (F) Flared mouth protects cable from chafing and crystallization due to vibration. (G) Adequate length for conductor to clear insulator disc . . . cable can be extended either above or below.

*Highest Holding Power of any Comparable Clamp



Pull Test Data . . . holding strength in pounds

1/0 ACSR—3850 2/0 ACSR—4150
4/0 AL —4050 4/0 ACSR—5975
336.4—18/1 ACSR—8950

Five Sizes for Complete Range

See the table below. The slip-strength of the clamp is a minimum of 90% of rated-breaking-strength of all-aluminum cables within clamp range.

RECOMMENDED for ALL-ALUMINUM and ACSR CABLE

CATALOG NUMBER	CLAMPING RANGE IN INCHES	
	Minimum	Maximum
Type ADE-46	.18	.46
Type ADE-60	.36	.60
Type ADE-70	.46	.70
Type ADE-86	.55	.86
Type ADE-98	.68	.98

For more complete information consult your nearest* ANDERSON *representative

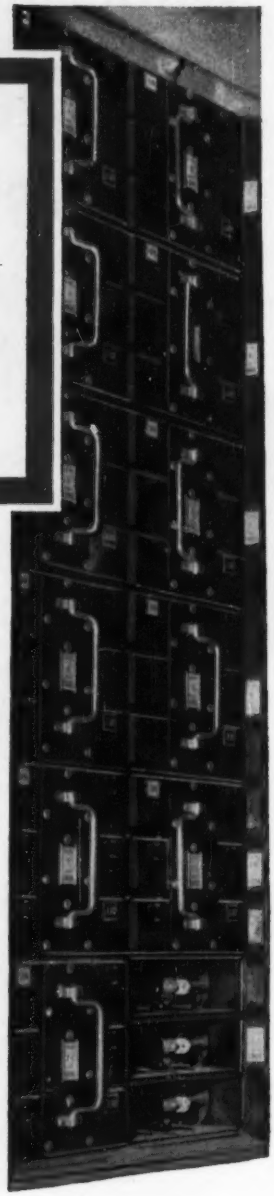
Aluminum and Bronze **POWER CONNECTORS • CLAMPS • FITTINGS • ACCCESSORIES for SUBSTATION • TRANSMISSION • DISTRIBUTION**

ANDERSON ELECTRIC
CORPORATION
P. O. DRAWER 2151 • BIRMINGHAM 1, ALABAMA

*Formerly Anderson Brass Works, Inc.

. . . "After these two experiences with FUSETRON dual-element Fuses, we use them throughout our Entire Plant."

J. W. Sanders, CHIEF ELECTRICIAN
(Division of Simmons Co.) ROSEMARY MFG. CO.
ROANOKE RAPIDS, N. C.



"SOLENOIDS WERE BURNING UP AND STARTING *FIRES* — *Until we changed to FUSETRON FUSES.*"

"A fire in our weaving room is just about the gravest danger we can face. If the fire isn't checked immediately, it can quickly spread throughout the room.

"You can imagine then how concerned we were with fires started by solenoids burning up in heavy lint locations. With 500 looms in use in 3 weaving rooms, we didn't know where to expect the next fire.

1

"We definitely had to find safer solenoid protection than we were getting from one-time ordinary fuses in use. We decided to try Fusetron dual-element fuses and installed them in the summer of 1954.

"It was a big relief when Fusetron fuses turned out to be the answer. I'll knock on wood, but we haven't had a fire since we installed them.

"In addition, this move to Fusetron fuses also cut production costs. We eliminated needless down-periods and we no longer have to repair or replace burned-out solenoids."

"WE CUT UNNECESSARY DOWN-TIME AND MAINTENANCE *COSTS By installing FUSETRON FUSES.*"

"Several years ago we had a heating problem in our main panels that was causing ordinary renewable fuses to blow.

"These outages occurred several times weekly in each panel, so down-time costs were really adding up and costing our company money.

"Also, after each blow our maintenance men would spend time checking the circuit for trouble, only to find the outage was caused by excessive heating in the panel.

2

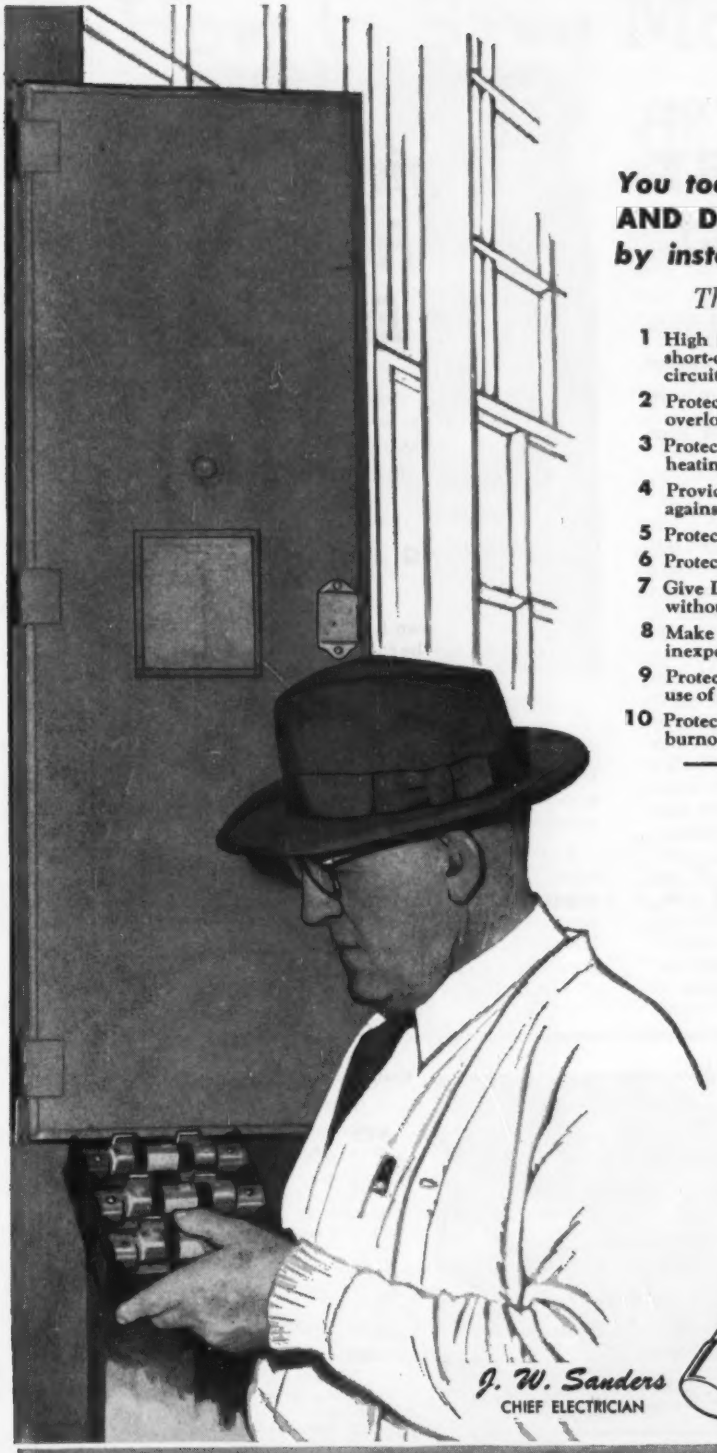
"We discussed the situation with a salesman and he showed us that Fusetron dual-element fuses were cooler operating and would eliminate our trouble.

"They sure did! The change to Fusetron fuses of proper size for safe protection was completed in 1953. We haven't had any unnecessary shut-downs since then.

"Our maintenance men sure like the change. Any outage today indicates trouble, and the men know they are not wasting time when they check the circuit.

"Because of this and other satisfactory experiences with Fusetron fuses, we individually protect all our motors with them as well as using them throughout the rest of the electrical system.

"I wish we had kept a record to show how much money we saved by equipping each motor with Fusetron fuses. I am reasonably certain that the difference in motor burnouts alone would represent considerable money."



You too, CAN REDUCE FIRE HAZARDS AND DOWN-PERIODS *by installing FUSETRON FUSES!*

They provide 10 Point Protection

1. High interrupting capacity—protect against heaviest short-circuits. Have proven on tests to open safely on circuits set to deliver in excess of 100,000 amperes.
2. Protect against needless blows caused by harmless overloads.
3. Protect against needless blows caused by excessive heating—lesser resistance results in cooler operation.
4. Provide thermal protection — for panels and switches against damage from heating due to poor contact.
5. Protect motors against burnout from overloads.
6. Protect motors against burnout due to single phasing.
7. Give DOUBLE burnout protection to large motors — without extra cost.
8. Make protection of small motors simple and inexpensive.
9. Protect against waste of space and money — permit use of proper size switches and panels.
10. Protect coils, transformers and solenoids against burnout.

Write for bulletin FIS.

FOR LOADS ABOVE 600 AND UP TO 5,000 AMPS., *Use BUSS Hi-Cap Fuses . . .*

They have an interrupting capacity sufficient to handle any fault current regardless of system growth.

They can be coordinated with Fusetron fuses on feeder and branch circuits to limit fault outages to circuit of origin.

Write for bulletin HCS.

J. W. Sanders
CHIEF ELECTRICIAN

Play Safe! Install FUSETRON dual-element Fuses and BUSS Hi-Cap Fuses throughout entire Electrical System!

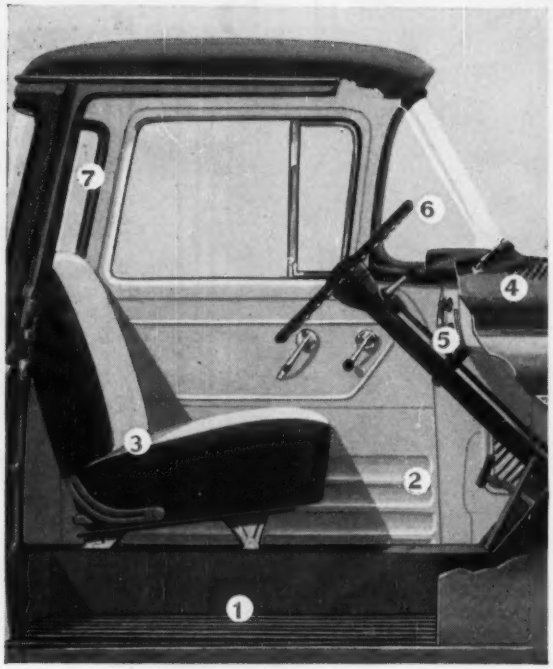
FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

BUSSMANN MFG. CO. Div. McGraw Electric Co.
University at Jefferson St. Louis 7, Mo.

856

This cab lets you TAKE IT EASY on tough jobs!

Modern features in new Chevrolet truck Flite-Ride cabs make your work easier and safer than ever before . . . give you the pleasure and prestige of style that equals many passenger cars!

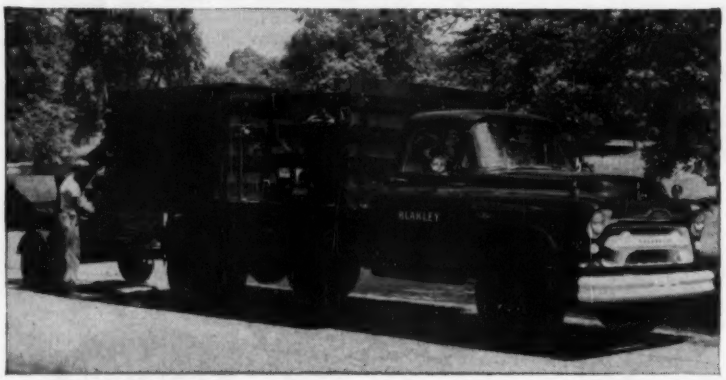


Those numbers in the picture (right) point out features that make business almost a *pleasure* when you work behind the wheel of a modern Chevrolet Task-Force truck! Here are some of the reasons why hauling in a Chevy is *easy on you:*

❶ *Concealed Safety Steps*—located *inside* the doors—stay clear of snow, mud, and ice, give you firmer, safer footing. ❷ *Spacious leg room* helps keep you comfortable all day long, brings you home fresher and more relaxed. ❸ *Nu-Flex seat* design means *comfortable* hauling! Jackstringer springs give ideal body support; seat back adjusts easily. ❹ *High-Level ventilation system* keeps the cab interior clean, cool, comfortable. Intake is at the bottom of the windshield—away from road heat and dust. ❺ *No-Glare instrument panel*, with handsome two-tone finish, puts instruments and controls within easy sight and reach. ❻ *Panoramic windshield* provides a full 1000 square inches of forward viewing area to make driving safer, easier. ❼ *Full-View rear window** adds to safe, convenient viewing as well as truck style.

And you'll find bright, stylish interior appointments that add to your sense of pleasure on the job. If your work calls for long hours on the road, you'll enjoy life more in a Flite-Ride cab! Check one over for yourself at your Chevrolet dealer's. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

**Optional at extra cost.*



They're the work champs of their class—with new V8's, automatic transmissions for every truck model!

You get *modern* power-performance in these Chevy medium-duty models! Compact short-stroke V8's do more work yet keep costs down. ***Hydra-Matic*** transmission† gives you no-shift hauling, reduced maintenance. And there's great ***Powermatic***‡—the first automatic transmission designed specially for big trucks!

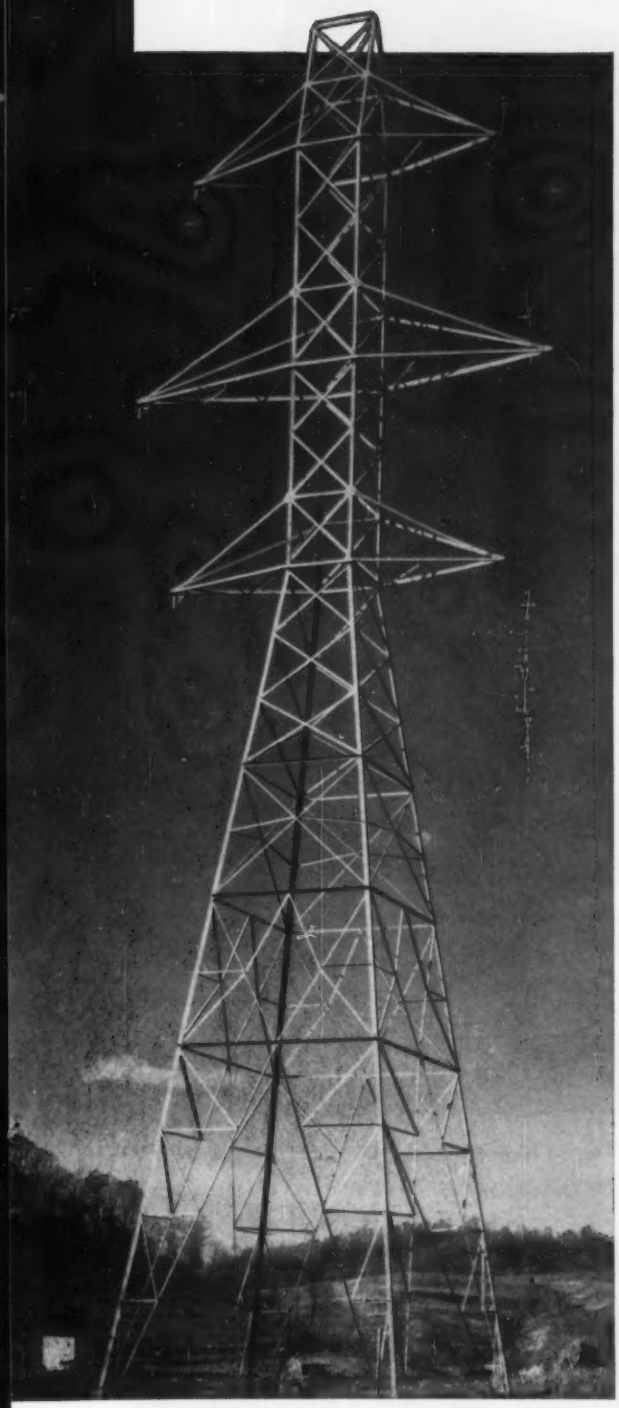
†Optional, extra cost, Series 3000-4000 models. ‡Optional, extra cost, Series 5000 through 10000 truck models.

CHEVROLET

NEW CHEVROLET TASK·FORCE TRUCKS

Anything less is an old-fashioned truck!

How to Save Money on TOWERS—



Transmission towers aren't bought from stockpile. They have to be "tailored" for the job . . . to meet the conditions existing, or those which you may expect to encounter in your area.

That is why, if you want to obtain the best possible towers for your line at the lowest possible price, you should weigh *all four* of the following points very carefully before placing an order:

1. COST OF TOWER DELIVERED TO YOU—Since 1911, American Bridge has operated a plant which specializes in electric transmission towers, substations and similar structures. Its modern equipment and facilities were designed specifically for that purpose, and savings accomplished assure you a quality product at the lowest possible cost.

2. COST OF FOUNDATIONS—American Bridge strives to keep foundation costs low in its tower design. The rotated-type tower and circular grillage are two examples of how American Bridge works with its customers in a cooperative effort to reduce foundation costs.

3. COST OF TOWER ERECTION—The tower members furnished by American Bridge fit in the field. *Ask any tower erector to verify this fact.* Members are made alike on all four sides to facilitate erection. The same diameter bolts are used throughout the structure. These are sorted, packed and marked so that no time is lost looking for the right bolts for the connections; and the bolts themselves are the best obtainable. The nuts can be screwed on by hand preparatory to final tightening. Every member is stamped in the steel with its correct number to coincide with easily read erection drawings. *The fundamental reason for all this is to save you money.*

4. COST OF MAINTENANCE—All American Bridge towers are galvanized *after* fabrication by the hot-dip process. The resultant coating of pure zinc lasts for years.

Every American Bridge Tower is Designed to Meet Specific Conditions

American Bridge towers are carefully designed for the specific conditions of loading expected on your line. The dead load, the wind, the ice, angles in line, broken conductors, etc.—if they are to be expected on your line, the towers are designed to take them.

American Bridge is the leading tower fabricator in America. To get there required that we be better . . . to stay there, we will continue to provide quality structures competitively and on time.

It will pay you to call our tower experts on your next job.

AMERICAN BRIDGE DIVISION, UNITED STATES STEEL CORPORATION • GENERAL OFFICES: 525 WILLIAM PENN PLACE, PITTSBURGH, PA.

Contracting Offices in: AMBRIDGE • ATLANTA • BALTIMORE • BIRMINGHAM • BOSTON • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DENVER • DETROIT • ELMIRA • GARY HOUSTON • LOS ANGELES • MEMPHIS • MINNEAPOLIS • NEW YORK • ORANGE, TEXAS • PHILADELPHIA • PITTSBURGH • PORTLAND, ORE. • ROANOKE • ST. LOUIS • SAN FRANCISCO • TRENTON

UNITED STATES STEEL EXPORT COMPANY, NEW YORK

AMERICAN BRIDGE

USS

UNITED STATES STEEL

Nicopress

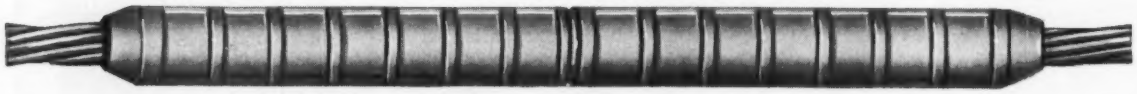
SPLICING SLEEVES

FOR LARGE CONDUCTORS AND HIGH-STRENGTH STRANDS

**Light in weight—Holds full strength of conductor—
High in conductivity**

Completed NICOPRESS Splice on 3/0 Copper Conductor

**Completed NICOPRESS Splice on ⅜" Extra High Strength
Copperweld Strand**



**Completed NICOPRESS Splice on ⅜" Extra High Strength
Galvanized Steel Strand**

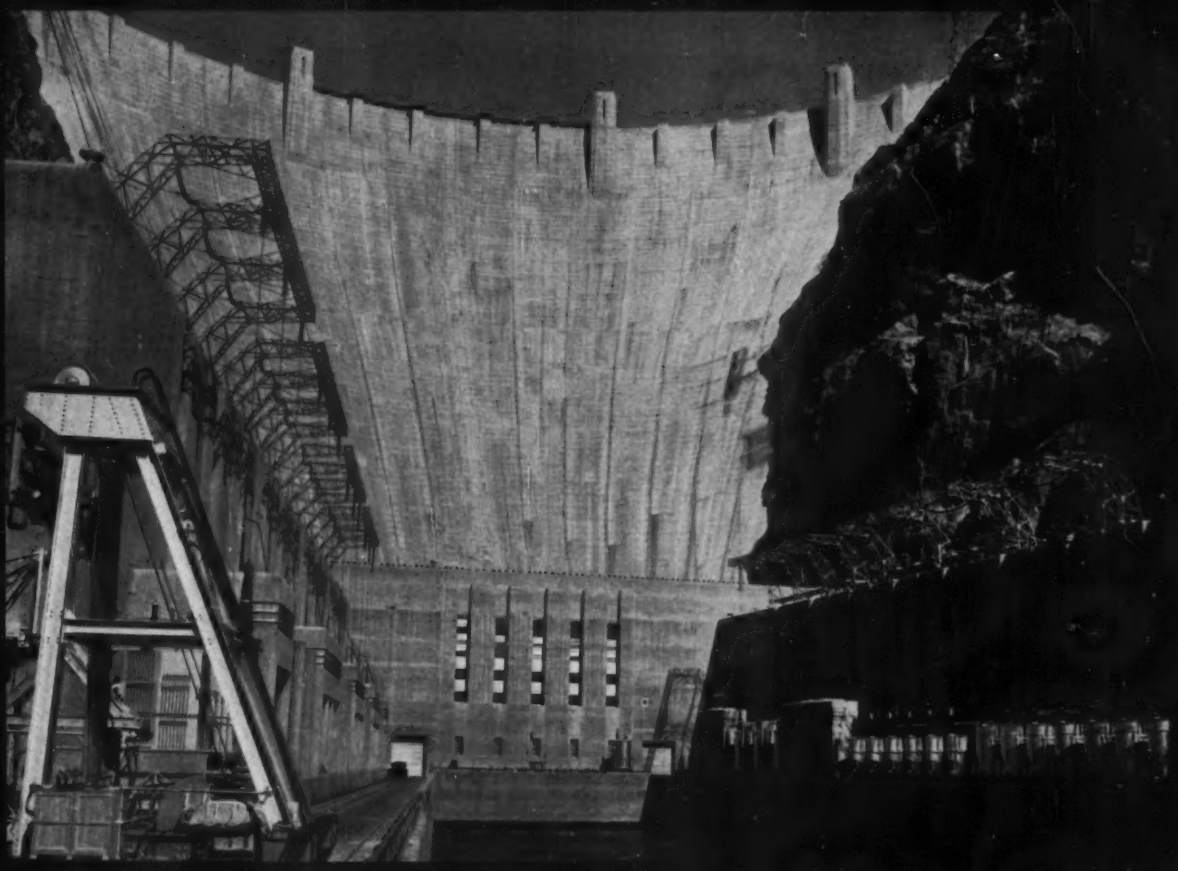
Nicopress Sleeves and Tools Patented in U. S. and Foreign Countries. "Nicopress" Registered in U. S. and Foreign Countries.

THE NATIONAL TELEPHONE SUPPLY COMPANY

The National Telephone Supply Company

5100 SUPERIOR AVENUE • CLEVELAND 3, OHIO

Canadian Mfg.: H. SLATER CO., LTD., HAMILTON, ONTARIO, CANADA • Export Distributor: INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N. Y.



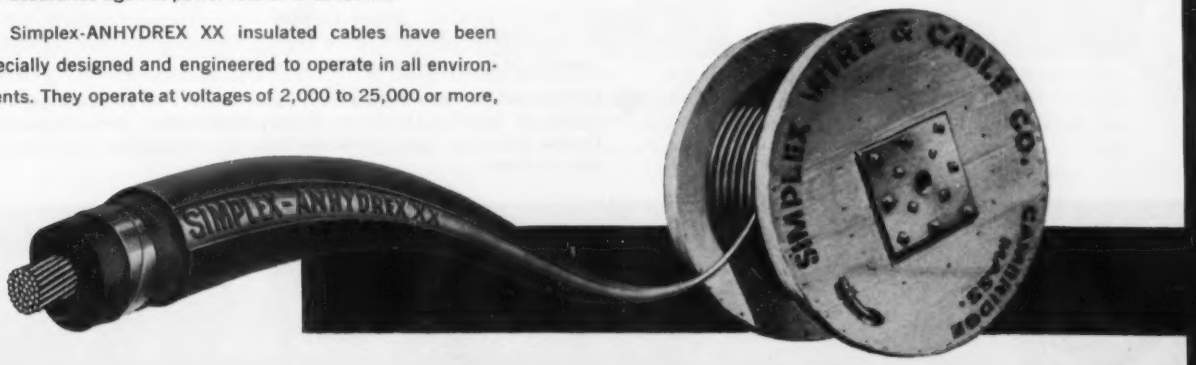
The responsibilities of being BIG

Management of huge power installations like this imposes a heavy load of responsibilities, indeed. Chief among them is the imperative necessity of maintaining power transmission at a steady, constant level.

Throughout the world, Simplex-ANHYDREX XX insulated cables are used extensively in power and communication transmission. Their proved performance and dependability are assurance against power loss or breakdown.

Simplex-ANHYDREX XX insulated cables have been specially designed and engineered to operate in all environments. They operate at voltages of 2,000 to 25,000 or more, at a conductor temperature as high as 85°C, for cables up to 17 KV. The ANHYDREX XX insulation is impervious to the action of ozone or other oxidizing agents.

Simplex-ANHYDREX XX is the logical choice for your high voltage applications. Write for our booklet 1009, which gives complete information. **SIMPLEX WIRE & CABLE CO.,** 79 Sidney Street, Cambridge 39, Mass.



123 YEARS EXCLUSIVELY

Specialized Design...Development...Production Of CV ARRESTERS Assures Finest Protection

At Electric Service unfailing protection is the most important goal in lightning arresters. This is achieved by a team of specialists with more than a century of experience in turning out the finest arresters. Men who have made a life study of lightning . . . surge currents . . . requirements of all types of installations. Experts who analyze protection problems of utilities . . . make better developments a daily procedure . . . constantly pre-test for positive performance . . . follow through with precision methods to offer you arresters known throughout the electrical industry for their positive, unfailing protection.

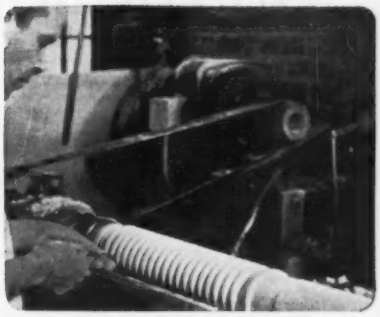
For positive protection of your lines, place your problems in the hands of Electric Service lightning arrester specialists.

1. The isolating external gap provides positive protection from line lockouts.
2. Exclusive "T" Grain Silicon Carbide valve element is unaffected by moisture or age. It has the highest thermal and surge current capacity of any valve element material.
3. Ultra-speed Multiple Arcing unit, coordinated with external gap, results in impulse sparkover slightly higher than the standard Crystal Valve but well below the industry average for expulsion type arresters.

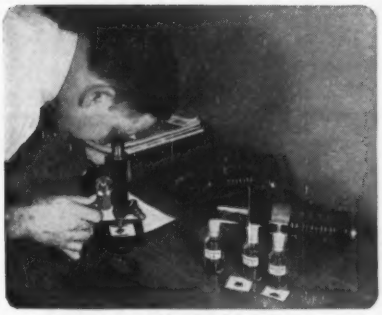
CRYSTAL VALVE
LIGHTNING ARRESTERS

ON ARRESTERS

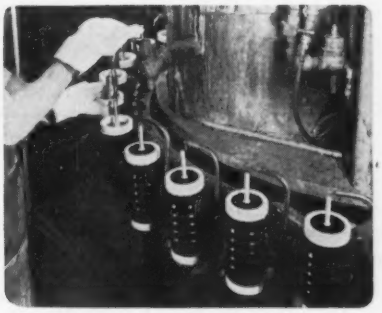
SAFEGUARD YOUR POWER LINES



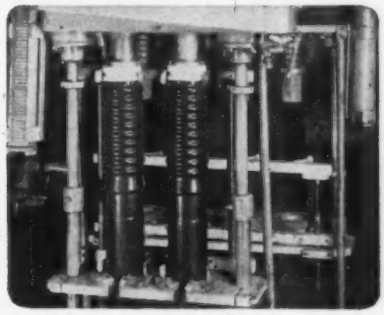
1. High strength Porcelain Body is formed on lathe before firing in kiln. Wet-process porcelain for electrical use provides dense, sturdy housing of high dielectric and thermal strengths.



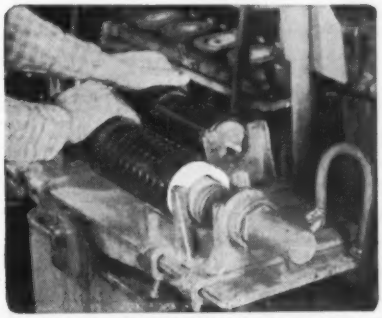
2. Inspecting Crystallite. Every batch of oxidized silicon carbide grain (used as valve element of Crystal Valve Arresters) is checked for grit size, coating and electrical performance.



3. Moisture-proofing Arrester bodies as they revolve, up-ended, on "merry-go-round." Molten compound is poured onto gasketed lower contact plate, around main ground stud member.

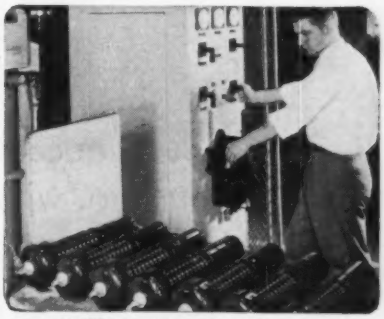


4. Precision Filling Machine automatically measures Crystallite grains into Arrester body. Upper contact plate and gasket retainer plate are placed on top of valve element.



5. Settling Crystallite (oxidized silicon carbide grain) gives a uniformly packed—not bonded—valve element. Grains are rocked, rotated, pneumatically packed.

6. Ultra-speed Arcing Units are assembled: electrodes, steatite ceramic rod and spacers, terminal "hardware." Spark-gap assembly is inspected, installed in arrester over retainer.



7. 100% Pre-Tests at 60 Cycles impose higher-than-rating voltages. Dynamic Test simulates operation under extreme conditions; Arc-over Test provides an additional proof of arrester performance.

Electric Service Manufacturing Co.

PHILADELPHIA 32, PENNSYLVANIA

Represented in Canada by Lyman Tube and Bearings, Ltd., Montreal and Toronto

"Skimpy Wiring" ads keep on the job for you!

Appearing in the Saturday Evening Post, This Week and Better Homes and Gardens – reaching more than 20,069,000 people – Kennecott's dramatic ads continue to warn homeowners about the evils of "Skimpy Wiring."

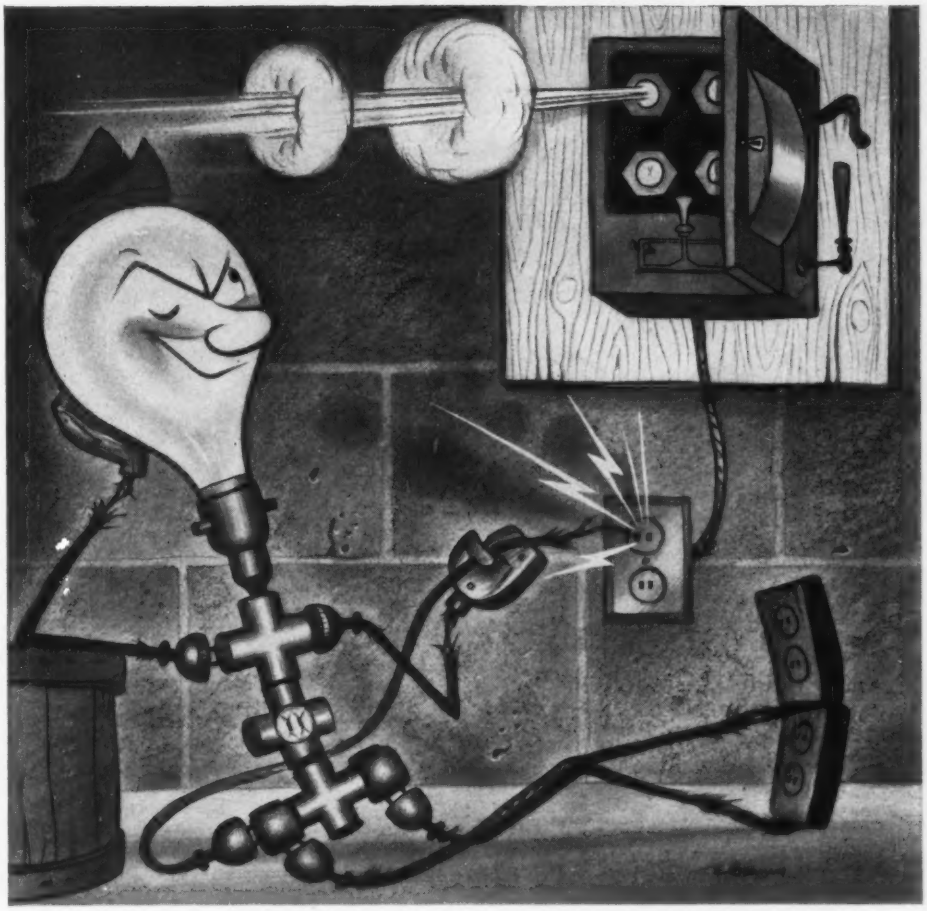
Here's another ad in Kennecott's drive to help you *increase your sales of power!*

Let Kennecott help you, too, with your local campaign for full ***HOUSEPOWER*** with *copper* wiring.

SEND FOR FREE PROMOTION MATERIAL

Send today for free reprints and poster-sized blowups of Kennecott's full-page national advertisements. Get free copies of the educational booklet. "The ABC of Home Wiring." Ask for complimentary home wiring Wall Chart, mat service folder and list of *at-cost* prices for large quantity orders of all material available. No cost, no obligation! Just write: Kennecott Copper Corp., Dept. W86, 161 East 42nd St., New York 17, N. Y.

FUSE-POPPER!



Is Skimpy Wiring haunting your home?
Do your electrical fuses keep blowing, or your circuit-breakers tripping? Here's the little character who's to blame . . . Skimpy Wiring, the electrical delinquent who plagues every *inadequately wired home*.

Not only does Skimpy Wiring cause fuse troubles, he affects your appliances. Slowly-heating toasters, broilers . . . sluggish vacuum-cleaners, electric razors . . . lights that flicker or dim . . . TV pictures that "wince" or grow small—all are signs that Skimpy Wiring is up to his mischief!

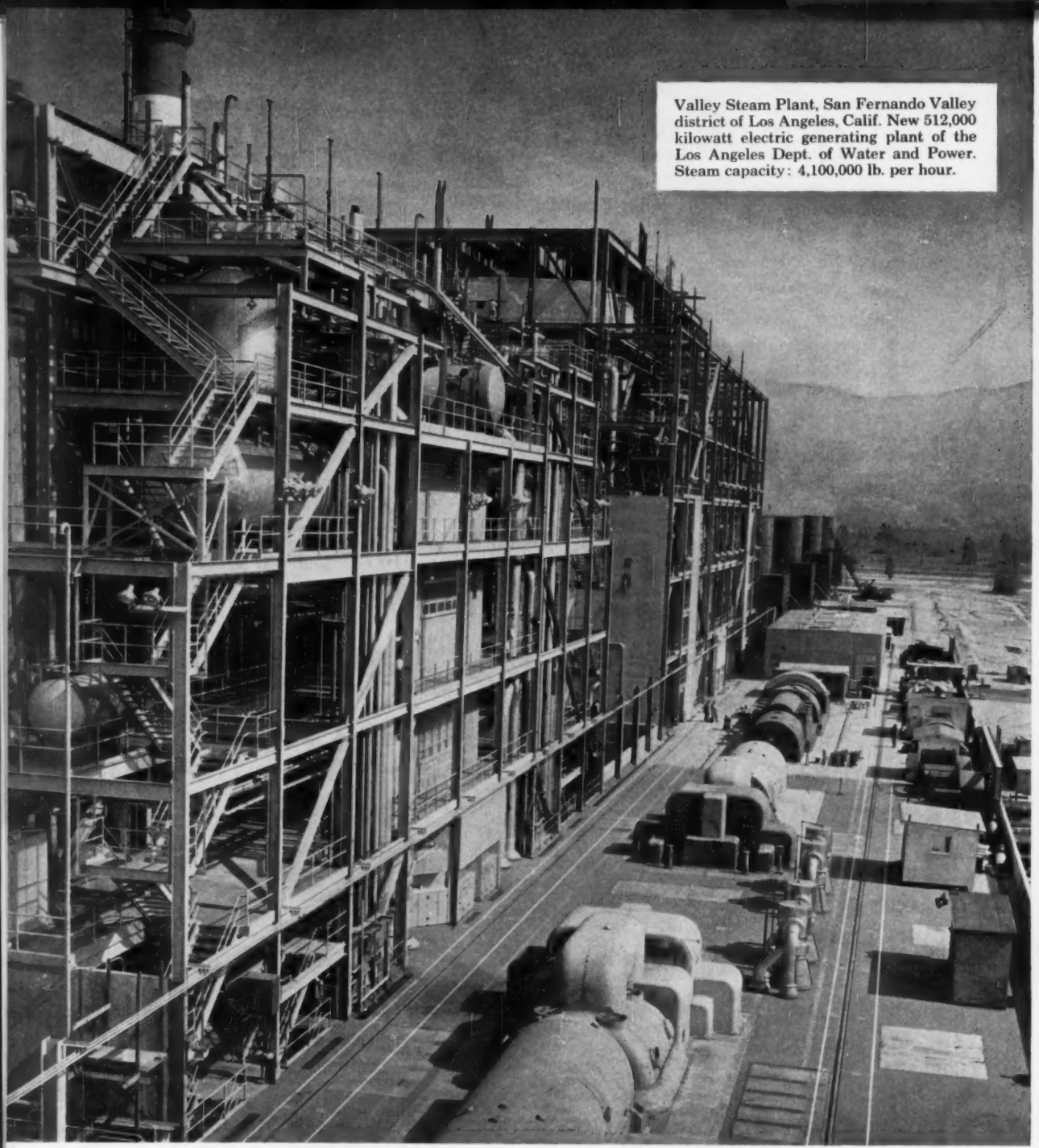
Skimpy Wiring can be dangerous, too. Weak, undersized wires, overloaded circuits, improper fusing, can lead to fire!

It's easier and can cost less than you think to change to full-powered, efficient *copper* wiring. Ask your electrical contractor or your local power company.

Get Free Booklet! Write for your *free* copy of "THE ABC OF HOME WIRING." Address Kennecott Copper Corporation, Dept. T-56, Box 238, New York 46, N. Y.

Kennecott Copper Corporation

Fabricating Subsidiaries: CHASE BRASS & COPPER CO. • KENNECOTT WIRE & CABLE CO.



Valley Steam Plant, San Fernando Valley district of Los Angeles, Calif. New 512,000 kilowatt electric generating plant of the Los Angeles Dept. of Water and Power. Steam capacity: 4,100,000 lb. per hour.

How big Valley Steam Plant demineralizes

• Valley Steam's feedwater requirements are typical for today's modern, high-capacity stations. Its raw water supply, delivered from the Los Angeles Owens River Aqueduct, contains 132 ppm total solids but is high in dissolved silica (18 ppm). The 1500 psig and 1850 psig boilers require a large amount of high quality feedwater.

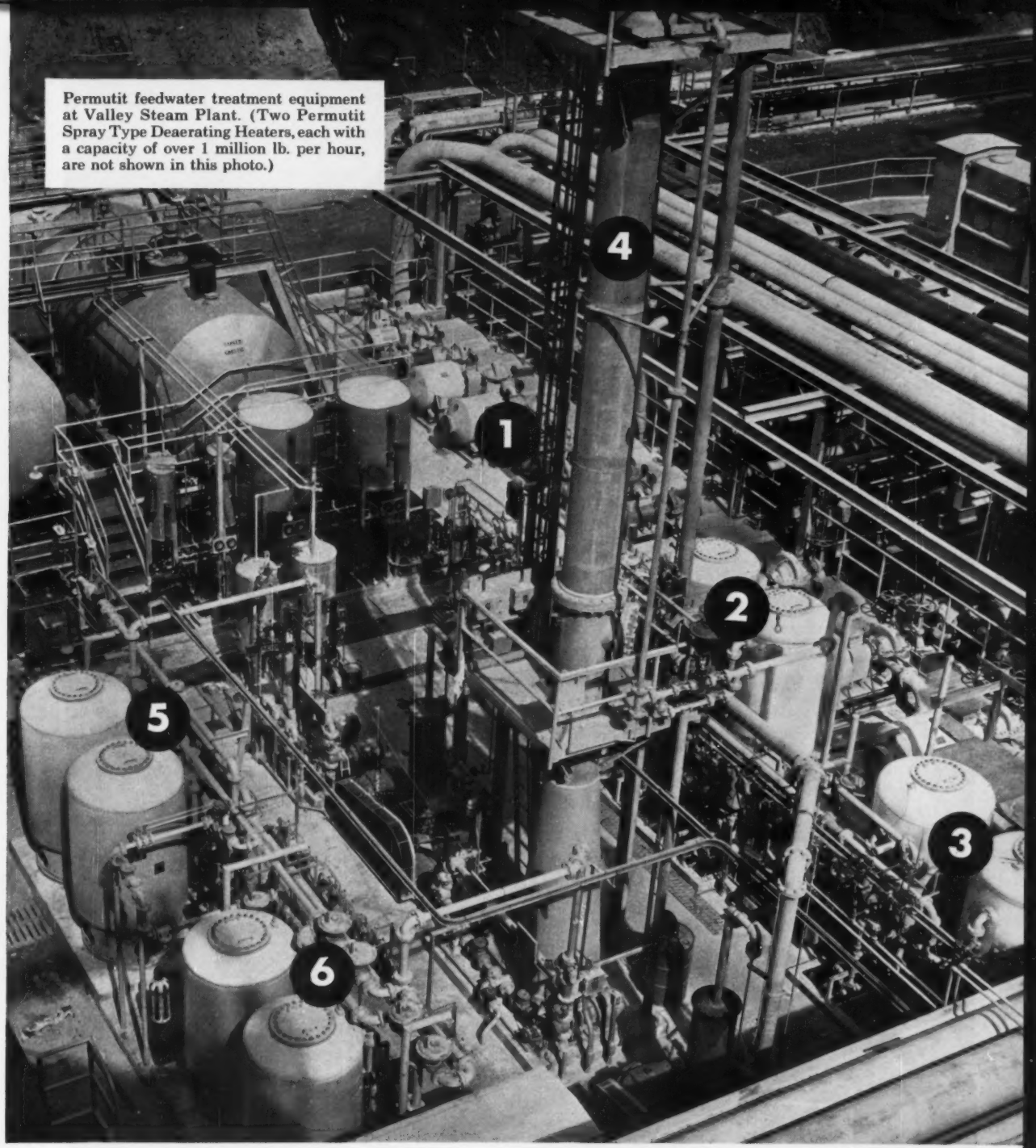
The 4-step PERMUTIT Demineralizer was custom-designed for this problem . . . not only in size, arrangement and number of ion exchange units, but also in the selection of the ion exchange resins.

That's why Permutit's broad experience with many different demineralizing systems and its manufacture of ion exchange resins as well as equipment are of particular value in solving large-plant water problems.

The Permutit Company, Dept. EW-8, 330 West 42nd St., New York 36, N. Y. Permutit Company of Canada, Ltd., 207 Queens Quay, Toronto 1, Ontario.

PERMUTIT EQUIPMENT FOR POWER PLANTS:

Demineralizers • Zeolite and Hot-Process Softeners • Dealkalizers • Deaerating Heaters • Pressure and Gravity Filters • Chemical Feeders • Aerators • Blowoff equipment • CO_2 Indicating Recorders • Zeolites and Resins • Instrument Panels • Control Cubicles



Permutit feedwater treatment equipment at Valley Steam Plant. (Two Permutit Spray Type Deaerating Heaters, each with a capacity of over 1 million lb. per hour, are not shown in this photo.)

its feedwater with **PERMUTIT®** equipment

1 Diatomite filters (behind column) remove dirt and other suspended matter . . . keep ion-exchanger beds clean for top efficiency.

2 Primary hydrogen cation units contain Permutit Zeo-Karb® . . . remove metallic cations such as calcium, magnesium, sodium.

3 Weakly basic anion units contain Permutit A exchange resin . . . remove chlorides, sulfates, nitrates.

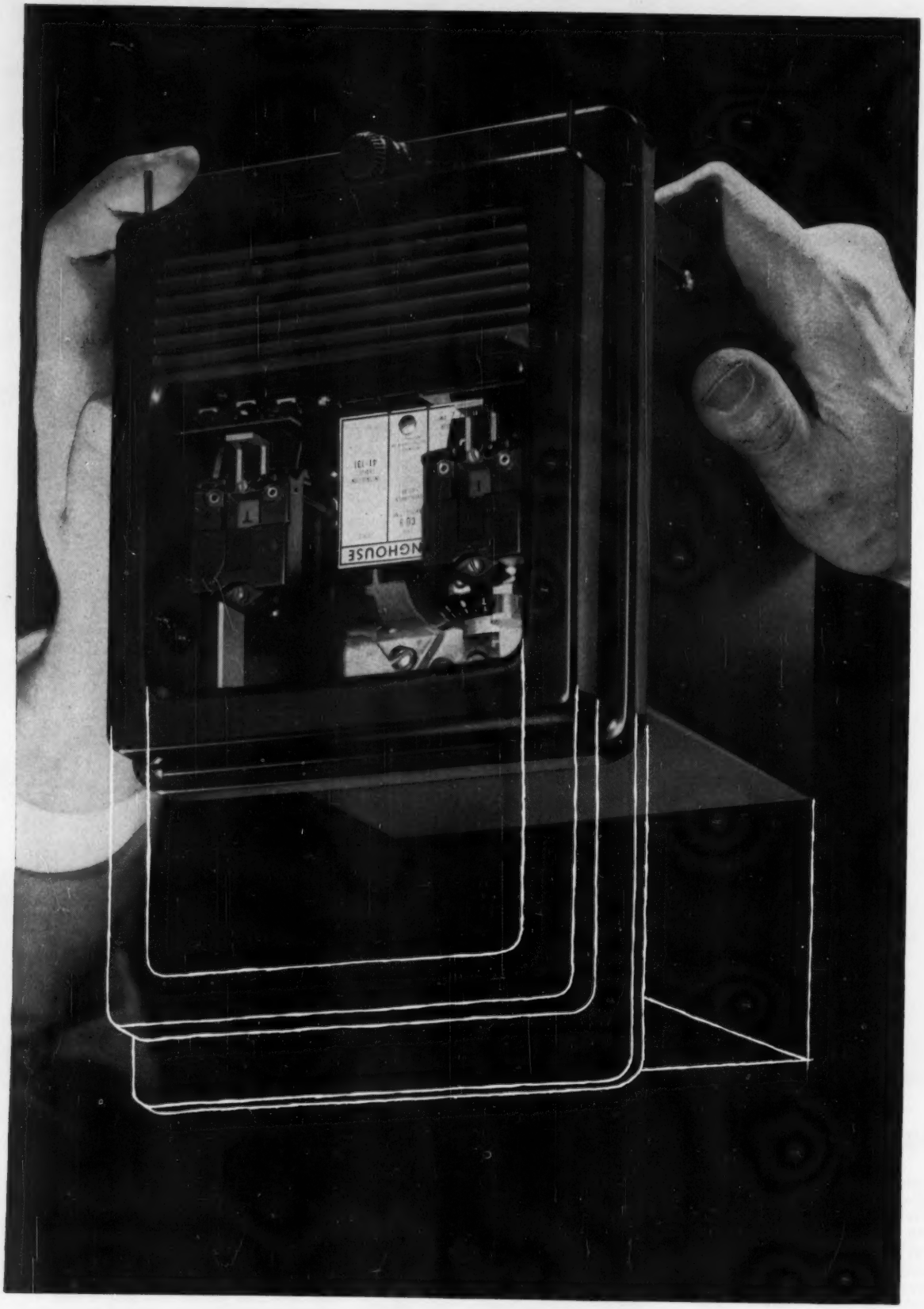
4 Vacuum deaerator removes CO_2 at low cost. Reduces the load on the second stage anion exchangers.

5 Secondary hydrogen cation units (Zeo-Karb) "polish" water by removing "slippage" from first cation units.

6 Strongly basic anion units contain Permutit S-2 resin . . . remove dissolved silica . . . also catch "slippage" from first anion units.

Quality of effluent: Zero free CO_2, under 1 ppm total solids, under 0.2 ppm silica.

For highest efficiency and lowest operating cost, the regeneration of the demineralizing equipment is completely automatic and operated by Permutit instrument panels and control cubicles.



Good news about relay design:

Size reduced one-third . . . panel space saved, improved operating features

New-design Westinghouse relays and Flexitest* cases are one-third smaller than previous designs, enable you to mount more relays per panel. Result: significant savings in space and construction costs.

Even though these units are more compact, components are more readily accessible . . . and operating efficiency has been improved.

This advanced design offers other important benefits, too. A universal case design permits either semi-flush or projection mounting. Number of styles has been reduced two-thirds to simplify ordering and stocking. Modern lines give case an attractive appearance.

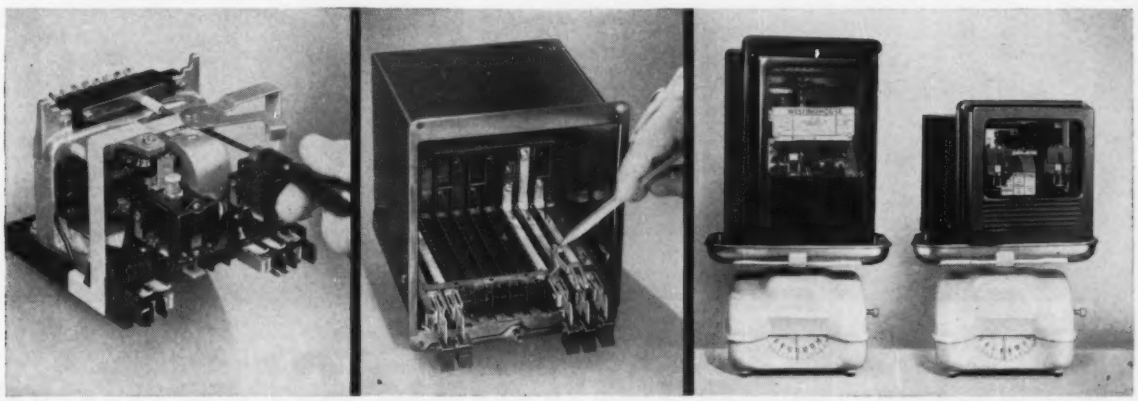
Whether you buy or build switchboards, be sure to specify new-design Westinghouse relays in Flexitest cases. They'll help you save space, assure reliable relaying operation, simplify maintenance and testing.

For further information about these newly designed relays and cases, contact your Westinghouse sales engineer and ask for a copy of B-6578, or write Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-40484

*Trade-Mark

COMPARISON OF SPACE REQUIRED — OLD AND NEW RELAYS

Type Relay	CO		CV		CR	
	Old	New	Old	New	Old	New
Number of relays in same space	5	7	5	7	5	8



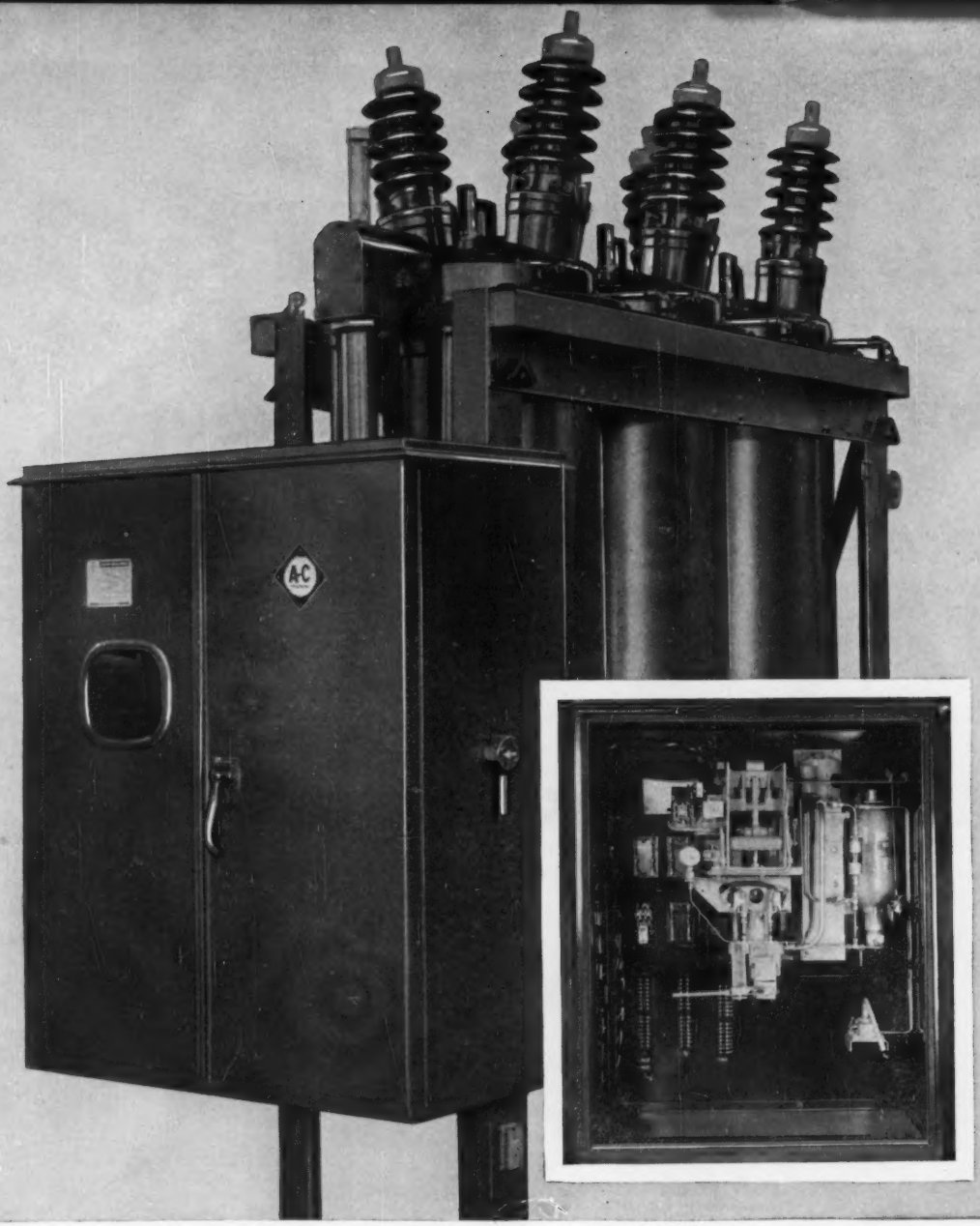
Accessibility—New-design chassis frame allows ready inspection and adjustment of operating elements. New latching arms provide positive locking for chassis, open for removal of operating unit.

Ease of Inspection—Strap-type connectors from switch blade to case terminal are visible, eliminating tracing circuit. Position of short-circuiting contacts visible even with relay unit in case.

Less Weight—Units weigh one-third less than earlier designs . . . are easier to handle and save customer stocking space. Although unit is more compact, it sets a new high in performance.

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***



Now Pneu-Draulic Operators

At the request of numerous utilities, Allis-Chalmers design engineers have now made available to you *Pneu-Draulic* operators on smaller breakers.

Enjoy the simplicity and reliability of the *Pneu-Draulic* operator on your next breaker.

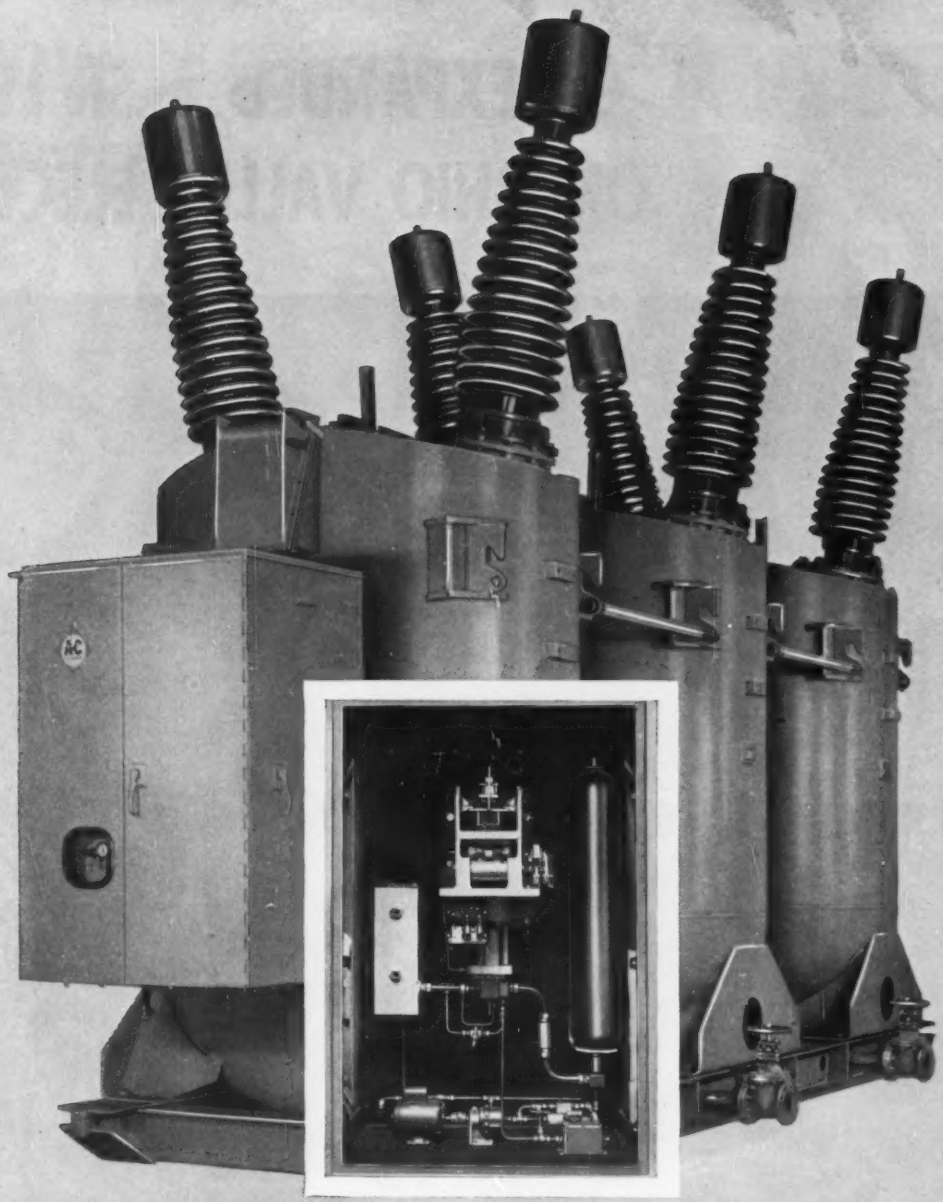
Acceptance of the *Pneu-Draulic* operator is based on the fact that it's as simple as it looks. It eliminates the mechanical problems inherent in previous mechanisms.

For complete information call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Pneu-Draulic is an Allis-Chalmers trademark.

LIVE BETTER ELECTRICALLY

ALLIS-



for Breakers 500 Mva and Larger

Features of *Pneu-Draulic* Operator

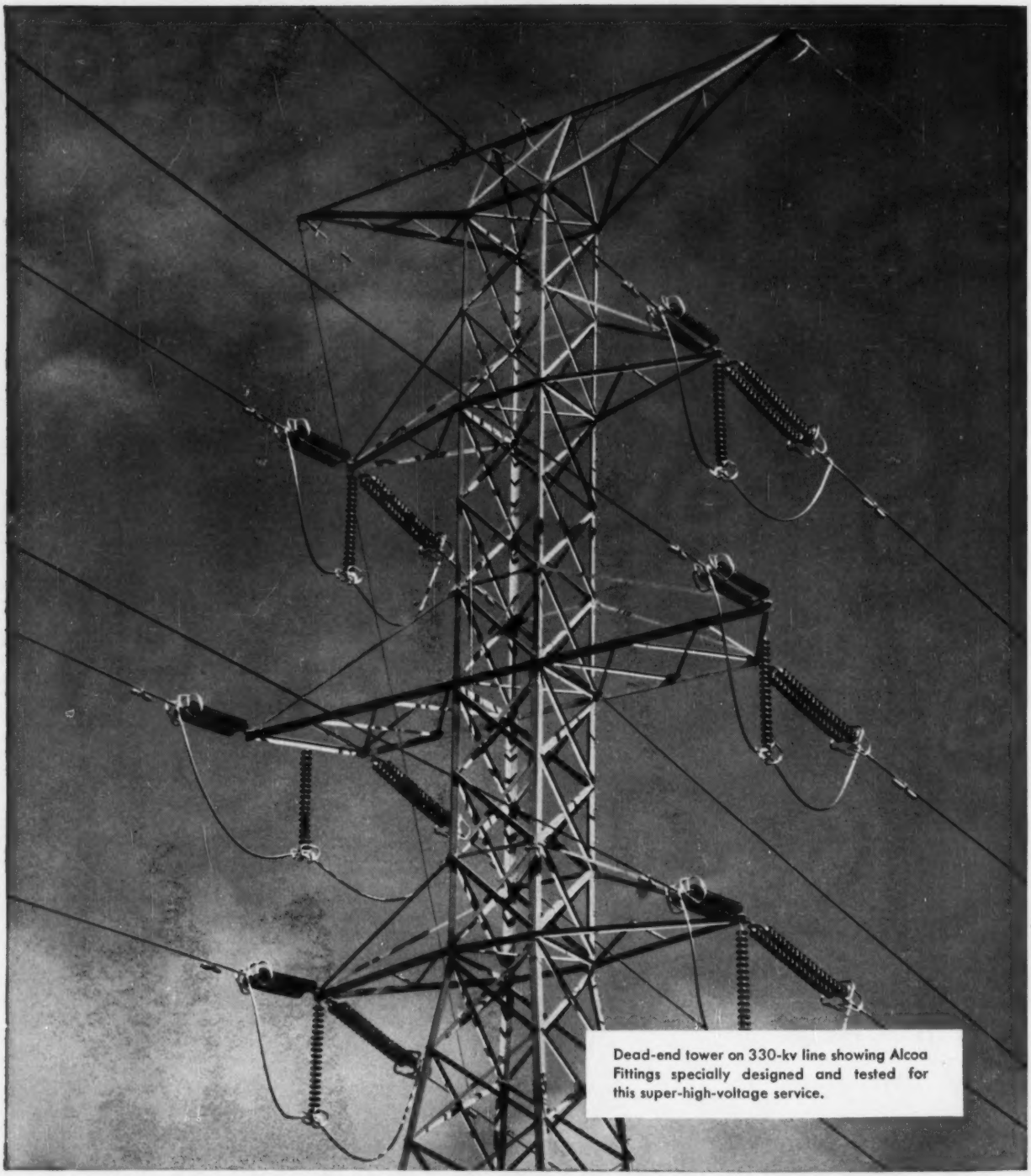
- Simple — Has fewer parts than other types of operating mechanisms.
- Eliminates moisture, corrosion, dust problems — entire system filled with oil containing inhibitor. Filtering eliminates dirt problem.
- Provides emergency closing — can be closed safely onto energized line when no control power is available.
- Mechanically trip-free.

CHALMERS

A-C ALLIS-CHALMERS

A-5131

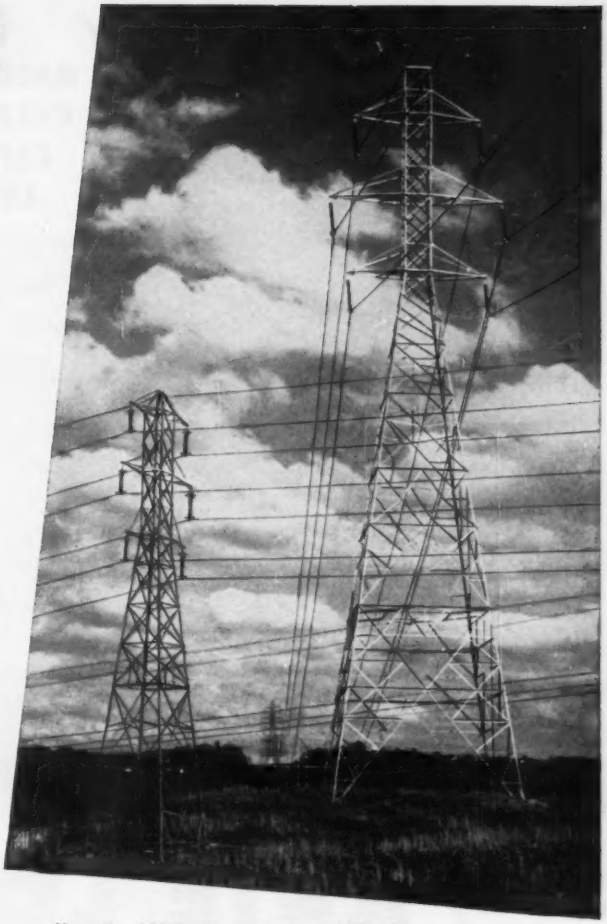
330-KV ALCOA EXPANDED ACSR LINES ON OHIO VALLEY ELECTRIC



Dead-end tower on 330-kv line showing Alcoa Fittings specially designed and tested for this super-high-voltage service.

NOW IN SERVICE SYSTEM

Diameter of 1.75 inches and high voltage set new mark for United States overhead conductor



Here the 330-kv line crosses a 138-kv line . . . constructed with Alcoa ACSR more than 30 years ago.

The nearly 400-mile double-circuit lines of the vast Ohio Valley Electric Corporation system, completed in 1955, set new records for United States overhead conductor: the rated voltage is 330-kv and the Alcoa® Expanded ACSR is 1.75 inches in diameter. Similar lines, totaling approximately 330 miles, are in operation on the American Gas and Electric system.

The fundamental research in electrical conductors that made these lines possible was begun by Alcoa more than 30 years ago. Projects in high-voltage aluminum conductors go on continuously in Alcoa's research division. This research division has kept pace with the progress of rapidly increasing loads, requiring larger central stations, higher voltage and bigger conductors. And, when the electrical industry is ready for even larger voltages, Alcoa will be ready with suitable conductors.

The same Alcoa Cable and Accessories, engineering personnel and production facilities that provided these 330-kv transmission lines are always at your service. When *you* have transmission problems calling for special conductor, bring them to Alcoa. No one is better equipped to help you solve them.

Just call your nearest Alcoa sales office. Or write Aluminum Company of America, 2306-H Alcoa Building, Pittsburgh 19, Pa.

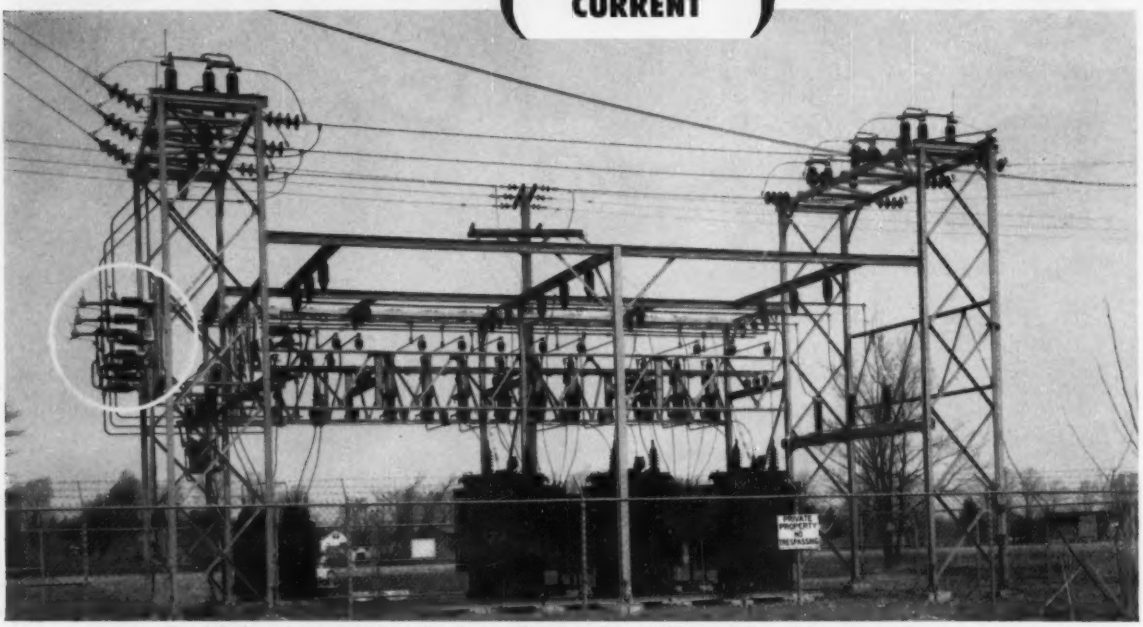
Your Guide to the Best in Aluminum Value

ALCOA ALUMINUM
ELECTRICAL CONDUCTORS
ALUMINUM COMPANY OF AMERICA
©ALCOA

Always Use Aluminum Accessories With Aluminum Conductors

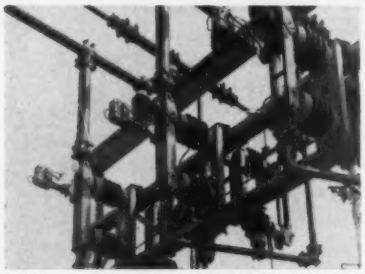
The ALCOA HOUR—Television's finest live drama—Alternate Sunday evenings

ANY PERPLEXING { LOAD MAGNETIZING, CHARGING OR CAPACITOR CURRENT } SWITCHING PROBLEMS?

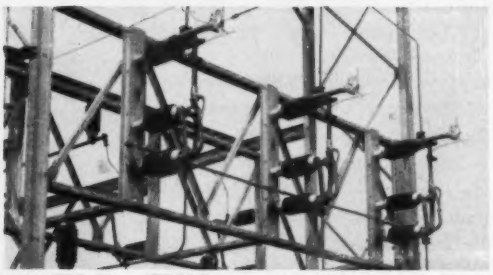


Flexible, loop-feed substation showing application of 34.5 KV, vertical break Lodrupter Switches.

Specify R&IE LODRUPTER

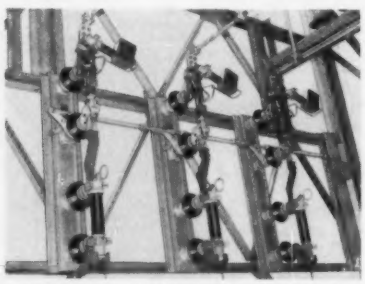


3000 ampere, Type HPE Lodrupter Switch (with 600 ampere interrupting units) for switching transformer magnetizing current.



34.5 KV, Type TRM Lodrupter Switch (in circle above) used to switch 30,000 KVA bank (fully loaded if necessary).

2000 ampere, Type TRE Lodrupter Switch, (with 600 ampere interrupting units) for switching transformer magnetizing current. (Switch connections not completed.)



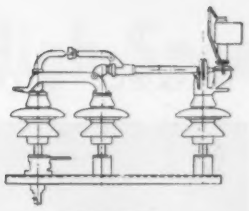
15 KV, Type AE Lodrupter Switches for switching load, with fuses for short circuit protection.

QUALITY — R&IE Lodrupter Switches offer the most dependable electrical and mechanical features: **(1)** Lodrupter units feature quick-break, quick-make,—permitting conventional motor mechanism operation. Interrupter chamber features nylon tube-and-follower assembly for long life, **(2)** Multi-break, single Lodrupter units for higher rated Type TRM and HPM, in voltages of 23,000 through 46,000, **(3)** All switches liberally meet NEMA Standard values for short time ratings, temperature rise, open-gap distance and insulation, **(4)** Blade-to-jaw contacts are the R&IE originated Hi-Pressure type, **(5)** Hinge contacts of vertical opening rotating insulator switches, and jaw swivel contacts of horizontal opening switches are identical in principle and are of the well-proved Hi-Pressure sealed contact type, an exclusive R&IE feature, **(6)** Rotating insulators feature weather-sealed, oilless, double ring ball bearings.

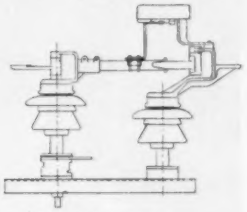
SWITCHES

Choose from

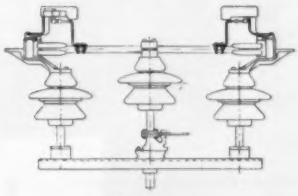
SIX TYPES
•
TWENTY RATINGS
•
600 AMPERE INTERRUPTING
•
400 THRU 2,000 AMPERES CONTINUOUS
•
7,500 THRU 46,000 VOLTS
•
MANUAL OR MOTOR OPERATION
•
POLETOP or STRUCTURE MOUNTING
•
UPRIGHT, UNDERHUNG or VERTICAL CONFIGURATION



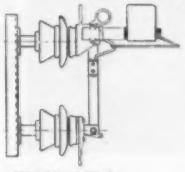
TYPE TRE
7.5 and 15 KV, 600 thru 2000 amps
TYPE TRM
23 thru 46 KV, 600 thru 2000 amps



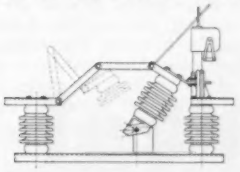
TYPE AE
7.5 and 15 KV, 400 thru 1200 amps



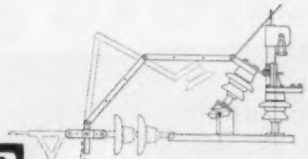
TYPE AET
23 and 34.5 KV, 600 amperes



TYPE HPE
7.5 and 15 KV, 400 thru 2000 amps
TYPE HPM
23 thru 46 KV, 400 thru 2000 amps



TYPE 3STE 3-insulator
7.5 and 15 KV, 400 and 600 amps



TYPE 2STE 2-insulator
7.5 and 15 KV, 400 and 600 amps

R&IE EQUIPMENT DIVISION
I-T-E CIRCUIT BREAKER CO. · GREENSBURG, PA.

R&IE

Other interrupting devices are—Arc Restrictors, Gas Blast and Power Center Interrupters.

GRIZZLY® POWER CABLES

Unretouched photograph

Under High Ozone Attack resulting from excessive voltage outlast 9 other leading brands tested!

In United States Rubber Company's special wire and cable testing laboratory, scientific devices record how cables react under abnormally high voltage.

In this test, 6 samples of 5 KV unshielded U. S. Grizzly Power Cables were pitted against 26 other 5 KV samples made by 9 leading competitors. Lengths were bent into U-shapes, roughly 8 times the cable's over-all diameter. They were then placed upright on a grounded metal plate with bottom of "U" resting on plate. Then a conductor-to-plate potential of 40,000 volts was applied. The test was allowed to run until all cables failed, with elapsed time to failure carefully checked for each. The accompanying chart shows dramatically the overwhelming superiority of U. S. Grizzly Power Cable.

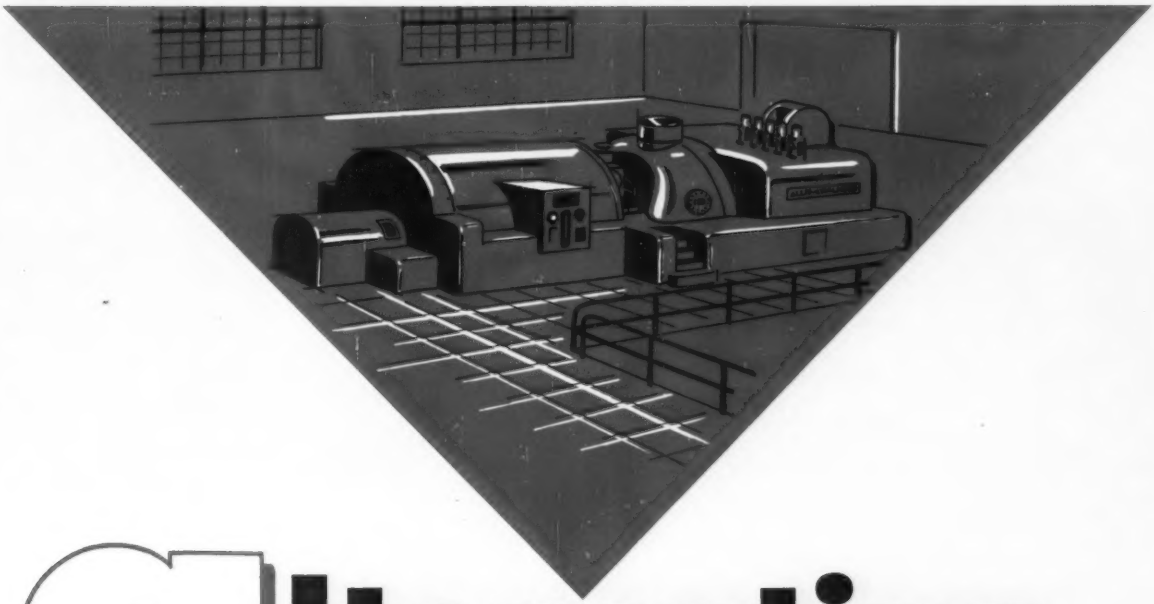
U. S. Grizzly Power Cables are obtainable at your "U.S." branch, distributor, or write us at Rockefeller Center, New York 20, N. Y.

Manufacturer	No. of samples tested	Elapsed time to failure—in hrs. Lowest value	Highest value
"U.S."	6	2941	6030
A	2	0	3
B	5	0	92
C	2	0	.6
D	3	12.5	144
E	3	300	490
F	2	30	46
G	6	.1	2509
H	2	0	0
I	1	25	25

Electrical Wire & Cable Department

United States Rubber

A NEW Era in Reliable High Speed Excitation System Response



alternating current

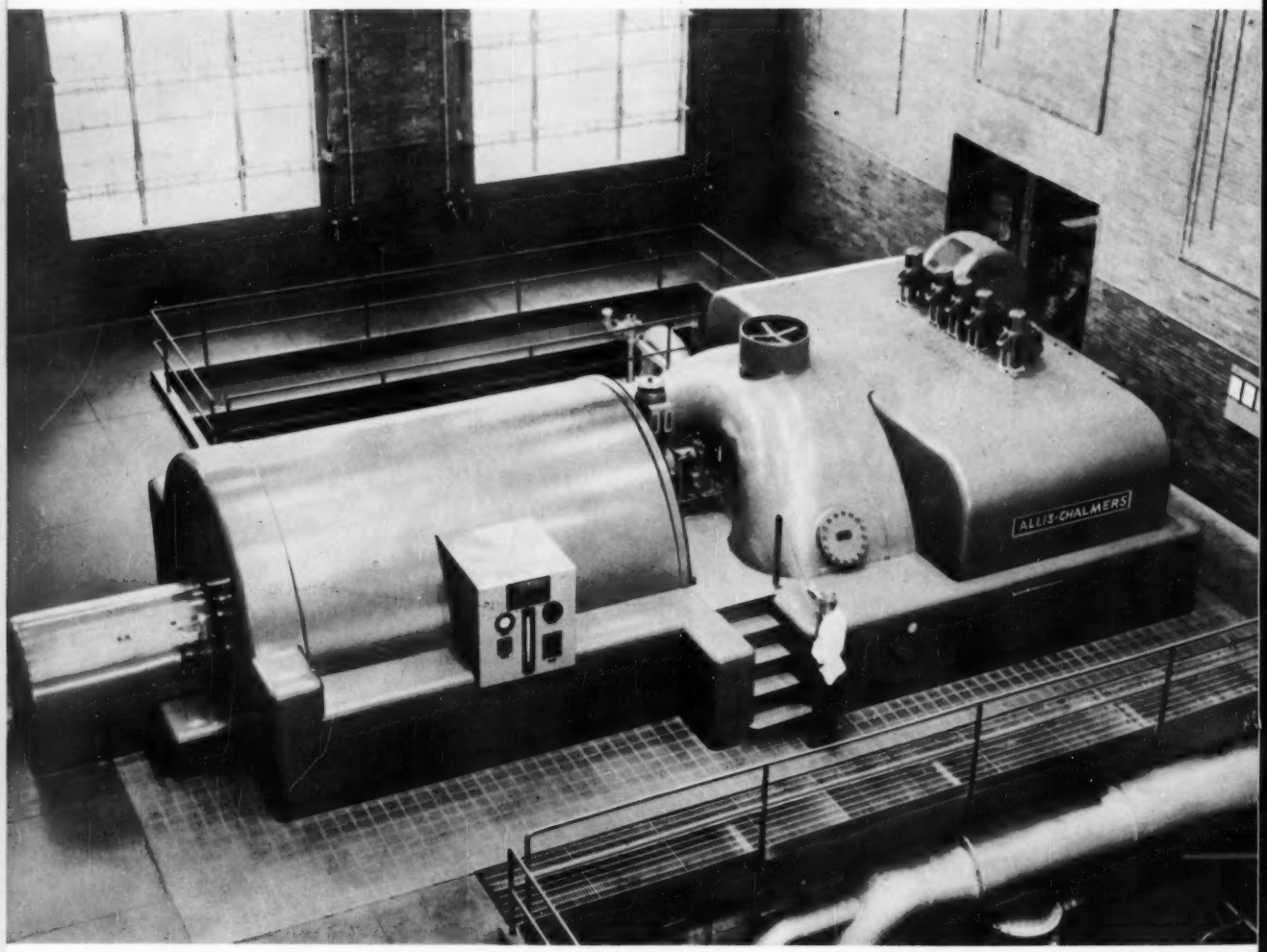
Commutator-less Excitation System

ALLIS-CHALMERS

A-5138

. . . now Installed and

alternating current



A new Generator Installation including the ac excitation system has been in service in a midwestern power plant. The steam turbine-generator unit is rated 33,000 kw.

ALLIS-

Operating

Commutator-less Excitation System

HERE'S PROOF

This All-New Alternating Current Excitation System Meets the Need for Reliability and Rapid Response in Excitation Systems for Turbine Generators.

Here is a new era in high speed exciter response through the use of inductor alternators and rectifiers for excitation. Magnetic amplifiers control the exciter magnetization by absorbing reactive kva from the alternating current exciter output.

Changes in exciter voltage are now accomplished as rapidly as the magnetic amplifier current can be changed. Overall excitation system response is determined mainly by the small time-constant of the magnetic amplifier.

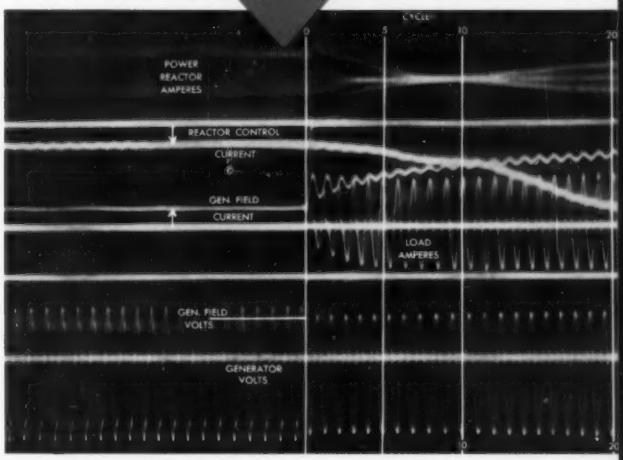
The ac output of the inductor alternator is converted to dc by selenium rectifiers, serving the purpose of a conventional commutator.

Increased Reliability and Safety

This new excitation system represents a significant advance in reliability and speed of operation. The ability to rapidly increase voltage applied to field is an important factor in maintaining generator stability. It permits safer operation closer to the unit stability limit and at higher power factor.

The extreme simplicity of the Allis-Chalmers ac system, the elimination of commutators, the use of all static components in the regulating and control circuits will provide more maintenance-free operation and greater continuity of service than any existing excitation system.

For Complete Information, contact your local Allis-Chalmers representative, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.



This oscillogram shows the response speed gained with maximum reliability under the ac excitation system. Load was added to generator operating under no load.

Installed on the level below are the rectifier cubicle and ductwork for the ac excitation system on the new turbine generator shown at left.

CHALMERS

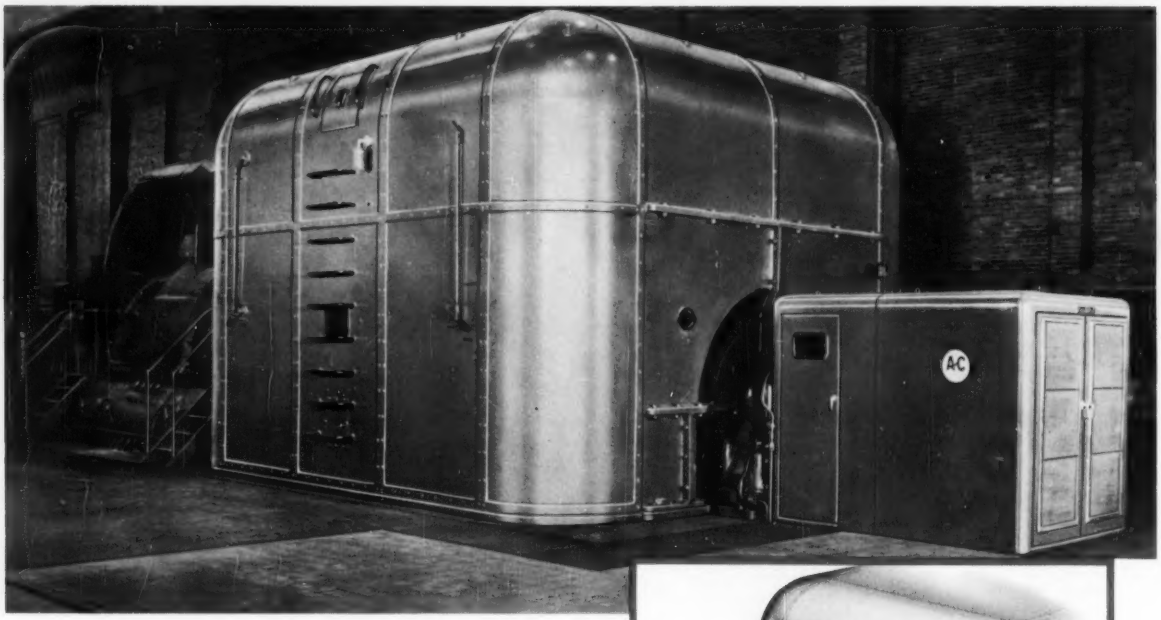
A-C ALLIS-CHALMERS

Alternating Current

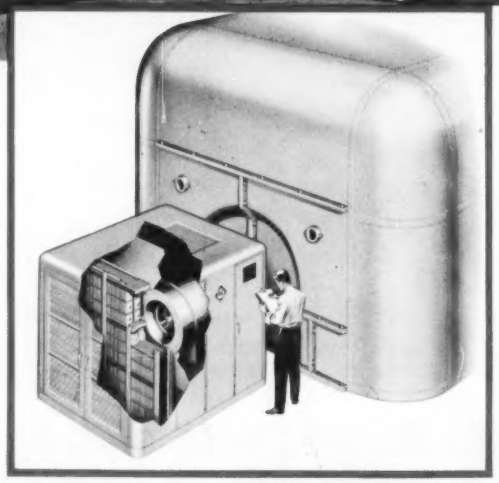
Excitation System

Installed on Existing Units

Not only is this excitation system intended for use on NEW steam turbine-generator units, but it can also be used on older generator units as the one shown here.



Here is the new excitation system added to a 43,750-kva generator which had been installed in 1938 without a direct-connected exciter. A number of additional installations are now planned, with exciter rating varying from 75 to 300 kw.

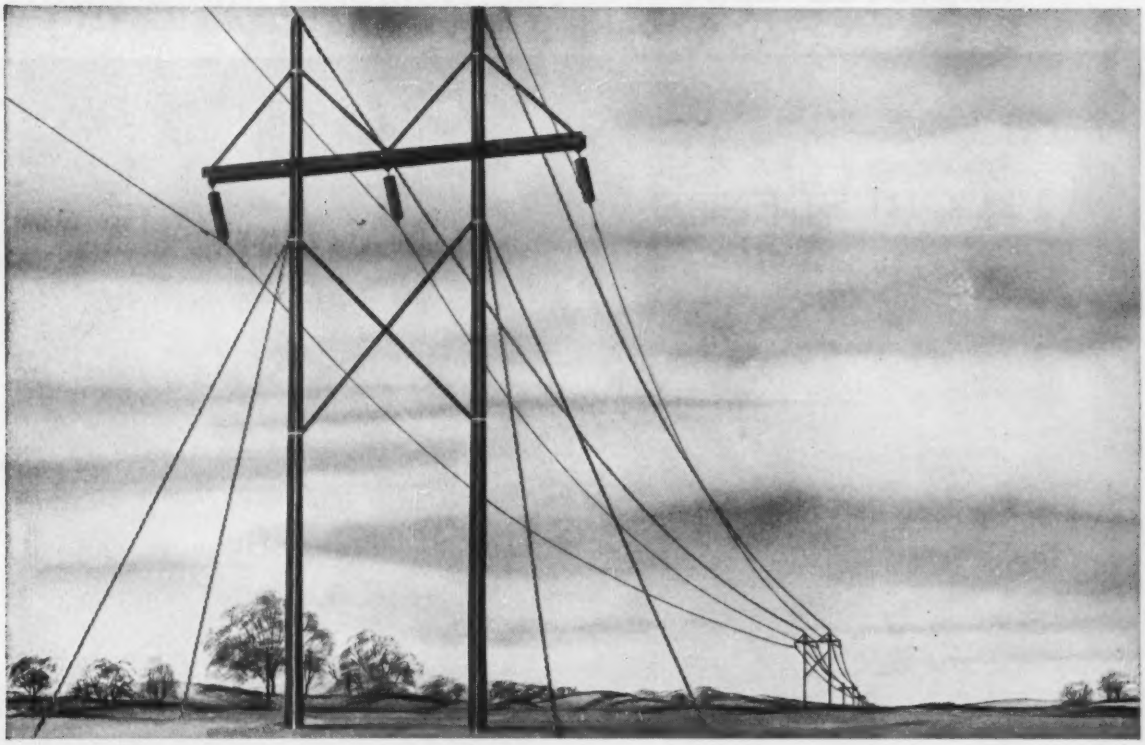


Cutaway view of the selenium rectifier cubicle portion of the ac excitation system installed on an older generator in a midwestern power plant. This installation was attained with a minimum structure modification, with exciter, rectifiers, and magnetic amplifiers in a single housing.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

GALVANIZED STEEL STRAND



made in the east and the west for prompt delivery

East or West, there's a single, convenient source of top-quality galvanized strand for ground, messenger and guy wire. That's because dependable time-proved CF&I Galvanized Strand* is produced at both Buffalo, N. Y., and Pueblo, Colorado.

This combination of plant sites enables CF&I to quickly and efficiently fill your strand requirements.

What's more, you're always sure of the quality of CF&I Galvanized Strand. Every phase of its production is handled by the makers of world-renowned Wickwire Wire Rope and Wire Rope Slings...every phase of its production is under CF&I's rigid quality control system.

Next time you need strand—whether it's to ASTM Specification A-122, A-363 or your specification—it'll pay you to contact the closest CF&I sales office listed below.

*three- and seven-wire constructions

WICKWIRE A CF&I PRODUCT

GALVANIZED STEEL STRAND
THE COLORADO FUEL AND IRON CORPORATION

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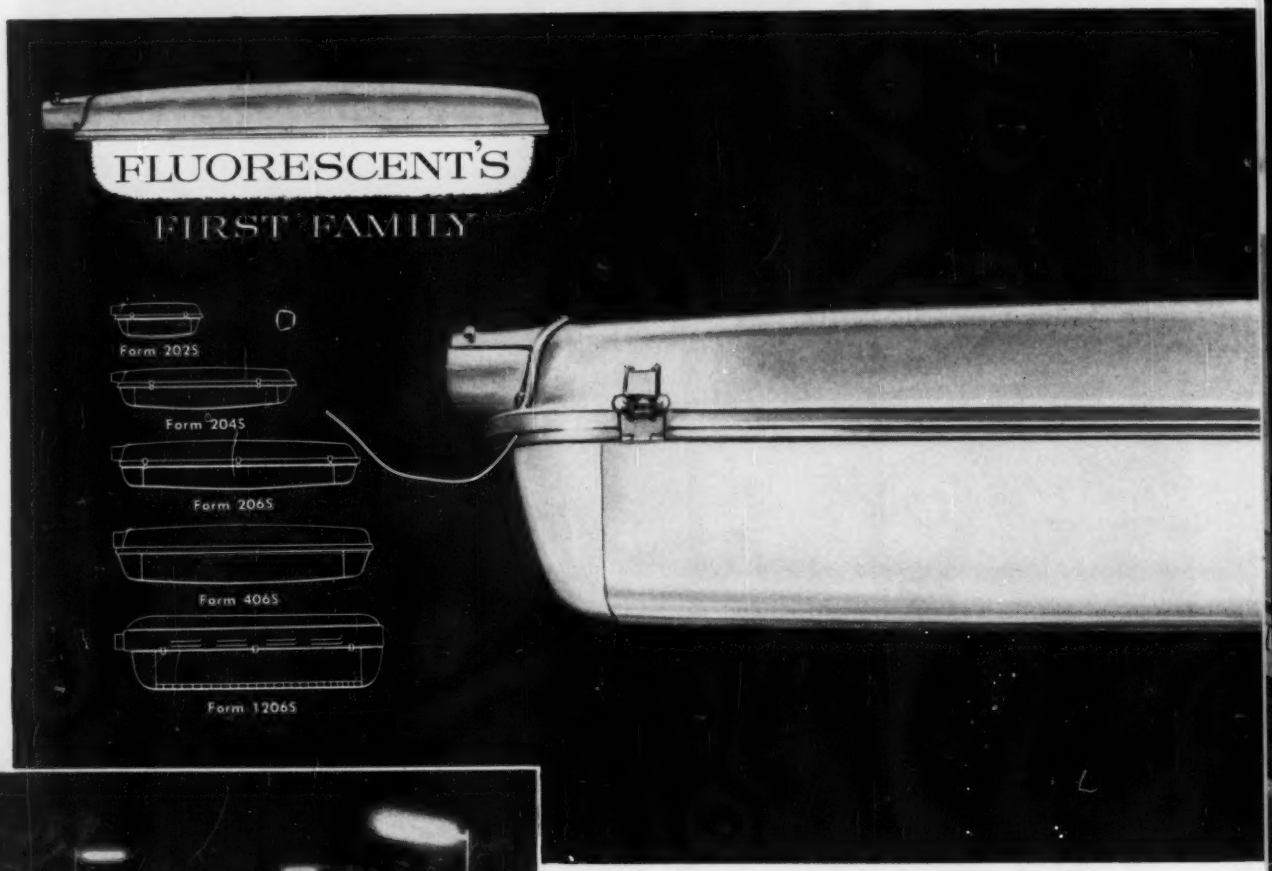
Albuquerque • Amarillo • Atlanta • Billings • Boise • Boston • Buffalo • Butte • Chicago • Denver • Detroit • El Paso • Ft. Worth • Houston • Kansas City Lincoln (Neb.) • Los Angeles • New Orleans • New York • Oakland • Oklahoma City • Philadelphia • Phoenix • Portland • Pueblo • Salt Lake City San Francisco • Seattle • Spokane • Wichita • CF&I OFFICE IN CANADA: Toronto

New G-E form 206S Fluorescent

improves appearance, visibility, adds safety



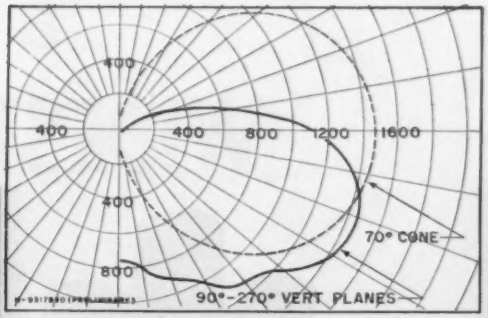
COMFORTABLE SEEING is added to safety in this shopping center. Business is increased because the pleasant atmosphere these G-E Form 206S luminaires create draws people into the area, encourages them to linger and shop, and develops "repeat" trade.

Medium business and shopping areas often are improperly lighted because they are too small to fall into a "main-street" category. Yet these areas get "main-street" type automotive and pedestrian traffic . . . have the same kind of safety and visibility problems. The answer is the new G-E Form 206S Luminaire (10,600 lumens). Easy to install and requiring little maintenance, this luminaire provides crisp, cool, diffused light with virtually no glare. Pavements have exceptional uniformity of brightness—even when wet. Comfortable seeing like this is good for business, too . . . draws people into the area to shop.

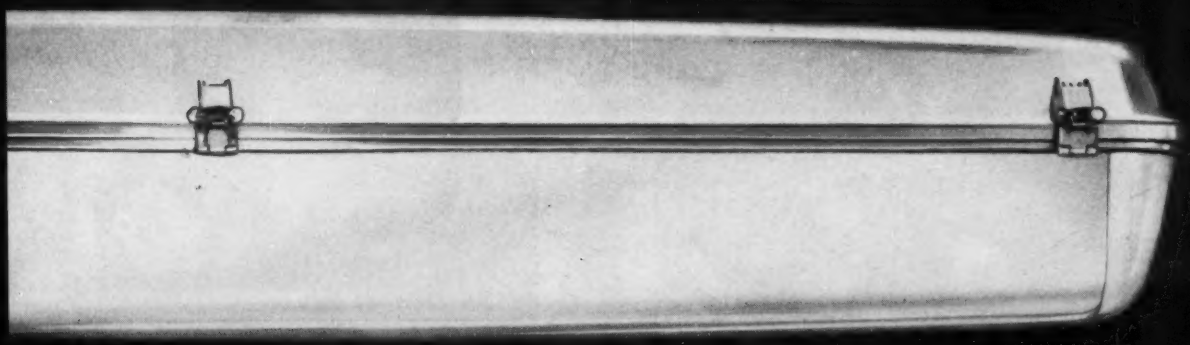
The Form 206S Luminaire is another member of G.E.'s revolutionary family of fluorescents, now making it possible to bring all the advantages of this type of street lighting—better visibility, more comfortable seeing, lower maintenance—to every street in the community. It's a development made possible by a co-ordinated design of luminaires, lamps, ballasts, and brackets for outdoor service. And each member of this family—whether it's the 202S (2700 lumens), 204S (6600 lumens), 206S (10,600 lumens), 406S (21,200 lumens), 1206S (64,000 lumens)—

Luminaire

to primary traffic areas



DISTRIBUTION OF INITIAL CANDLE POWER



contains many new structural design improvements to assure installation, operating and maintenance advantages. Some of these advantages are slipfitter mountings, weather-proof engineering, one-piece side-hinged globe, detachable reflector, pre-wired terminal board, integral ballasts, and new recessed, double-contact-base lamps.

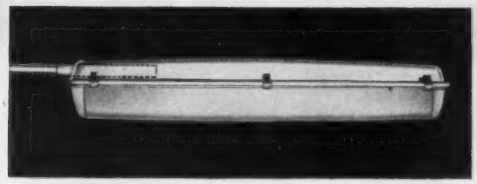
For more information on the outstanding new General Electric Form 206S or any other member of "Fluorescent's First Family," contact your nearest G-E Apparatus Sales Office, or write Section 452-164, General Electric Company, Schenectady 5, New York.

"Out of Darkness," a dramatic 16-mm sound film on how one community met and solved its street-lighting problems, is available from your nearest G-E Apparatus Sales Office.

Progress Is Our Most Important Product

GENERAL ELECTRIC

ONLY NEW G-E FLUORESCENT LUMINAIRES OFFER ALL THESE FEATURES



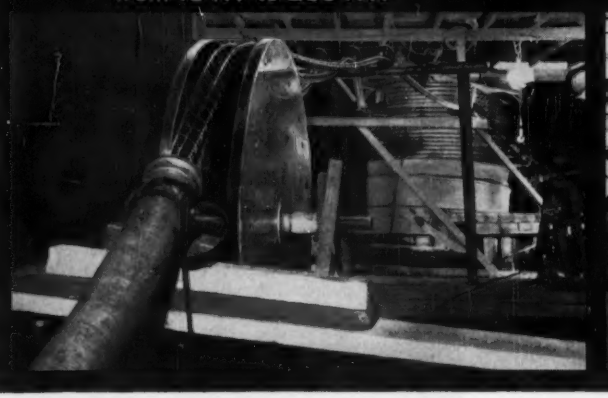
SLIPFITTER MOUNTING . . . pipe bracket slides easily into luminaire, giving perfect support and eliminating heavy, cumbersome clamp brackets. Simple, self-contained, two-bolt adjustment permits fast, easy leveling.

WEATHERPROOF ENGINEERING... new, resilient gasket material between hood and globe provides a uniform, positive seal against all elements. One-piece plastic globe retains clear appearance in all weather.

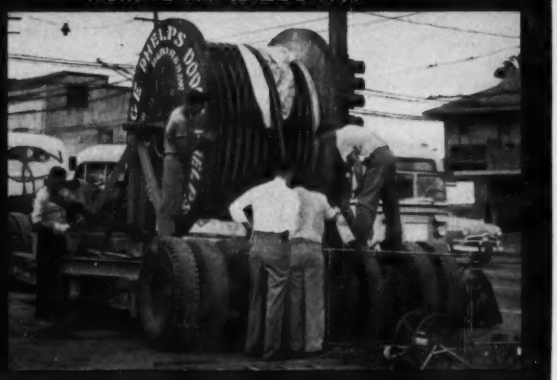
Phelps Dodge

WIDEST RANGE OF HIGH

Pipe Type, Compression Cable, from 15 KV to 230 KV.



Low Pressure, Oil-Filled Cable, from 15 KV to 230 KV.

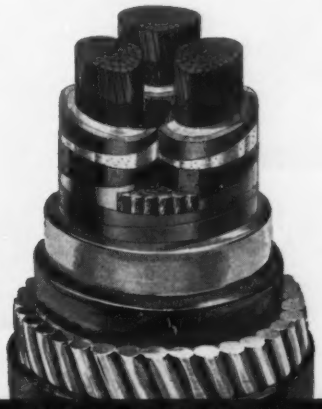


Consult Phelps Dodge for the correct answer to your requirements, regardless of voltage or type!

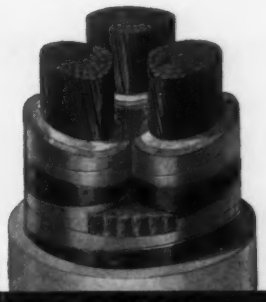
offers Industry's VOLTAGE POWER CABLE!

Only Phelps Dodge has manufacturing experience and operational "know how" with the entire range of high voltage cables which includes: oil compression, gas compression, high pressure oil, high pressure gas, pipe type cables; medium pressure gas, low pressure oil-filled, low pressure gas, submarine and solid type cables.

Low Pressure, Gas-Filled Cable, from 15 KV to 44 KV.



Submarine Cable, from 15* KV to 35 KV.

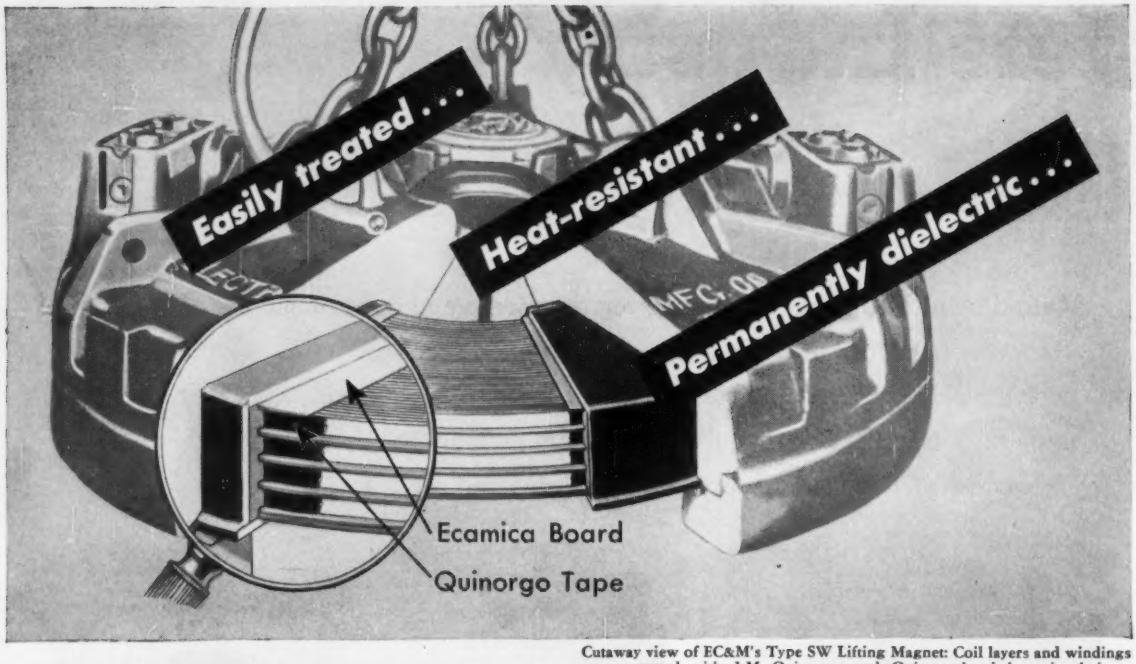


Solid Type Cable, from 15* KV to 69 KV.

*Lower voltage cables in this class also available.

PHELPS DODGE COPPER PRODUCTS CORPORATION

300 PARK AVENUE, NEW YORK 22, N. Y.



Cutaway view of EC&M's Type SW Lifting Magnet: Coil layers and windings are protected with J-M Quinorgo and Quinorgobord base insulations.

3 important reasons why both Quinorgo® and Quinorgobord® are used in EC&M magnets

Quinorgobord No. 1100 is impregnated and laminated by special EC&M processes into their ECAMICA Boards for coil layer insulation.

Quinorgo Tape No. 3000 is impregnated with compounds developed by EC&M and wet wound simultaneously with strap copper.

AFTER MANY TESTS of materials available, The Electric Controller & Mfg. Co., Cleveland, Ohio, selected both Johns-Manville Quinorgo and Quinorgobord, for use in their all-welded lifting magnets.

These materials provided the desirable and efficient mechanical and electrical properties needed for magnet duty. Each remains dielectrically stable under heat. Both are exceptionally free from magnetic particles and low in moisture content. Especially designed for treatment with other dielectrics, they are tough, relatively moisture-free, base materials.

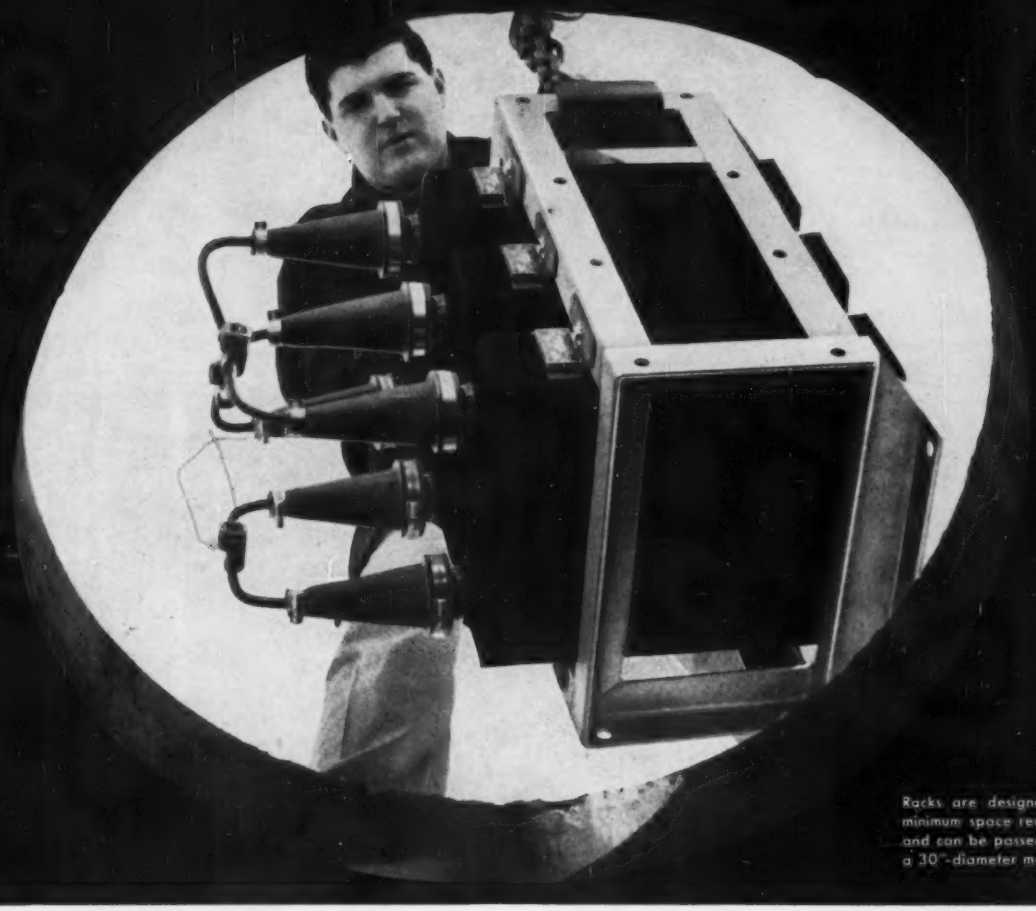
No. 3000 Quinorgo Tape insulates the strap wound coils. Its excellent space factor permits a higher number of turns of copper, resulting in greater lifting power. By a special EC&M process, No. 1100 Quinorgobord (a board-like sheet) is treated and combined with Mica to form ECAMICA* board. This, they use between the coil layers.

Other leading manufacturers, processors and laminators also find that these moderate-priced J-M pyrolysis-resistant electrical insulations help cut costs, improve insulation performance and lengthen service life of equipment. For complete information, write for booklet EL-40A. Address Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.

JOHNS-MANVILLE JM PRODUCTS

Registered Trade Mark of Electric Controller & Mfg. Co.

Johns-Manville
ELECTRICAL INSULATIONS



Racks are designed for a minimum space requirement and can be passed through a 30"-diameter manhole.

Submersible equipments...

L-M's New Secondary Network Capacitors Increase Capacity, Improve Voltage

Line Material's new 216 volt, 13⅓ kvar submersible capacitor equipments can be your answer to heavier network loading. Secondary capacitors will improve the low power factor of heavy motor loads, such as air conditioning. This substantially reduces loading on conductors and transformers, and helps to improve low voltage conditions. Capacitor units can be installed more quickly and at much less cost than system changes, such as larger transformers, cables and additional vaults.

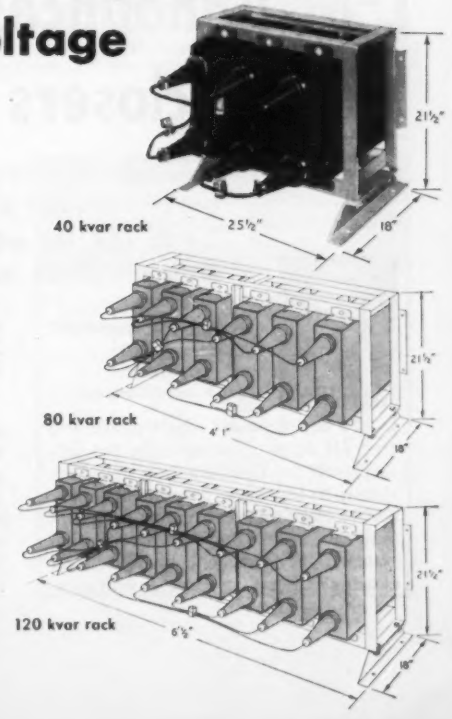
L-M's new secondary capacitors have outstanding product features such as aluminum metallic coating under a primer and finish coat of alkyd resin paint, strong solder-sealed bushings, and low-temperature Elemex liquid dielectric. Each unit is equipped with one terminal mounted current limiting fuse; bushings are enclosed in water-tigh covers.

Capacitor Racks

Capacitor units are available in 40, 80, and 120 kvar racks, entirely assembled at the factory and ready for installation in the field. Racks can be stacked or mounted on floor, wall, or ceiling in many arrangements to fit vault space. Ambient temperature limits are 55° C. for single-tier equipments and 40° C. for two- or three-tier equipments.

Get Complete Information

Ask the L-M Field Engineer for information on features, design, and delivery on L-M's new secondary network capacitors and capacitor equipments. Or write Line Material Company, Milwaukee 1, Wisconsin



LINE MATERIAL

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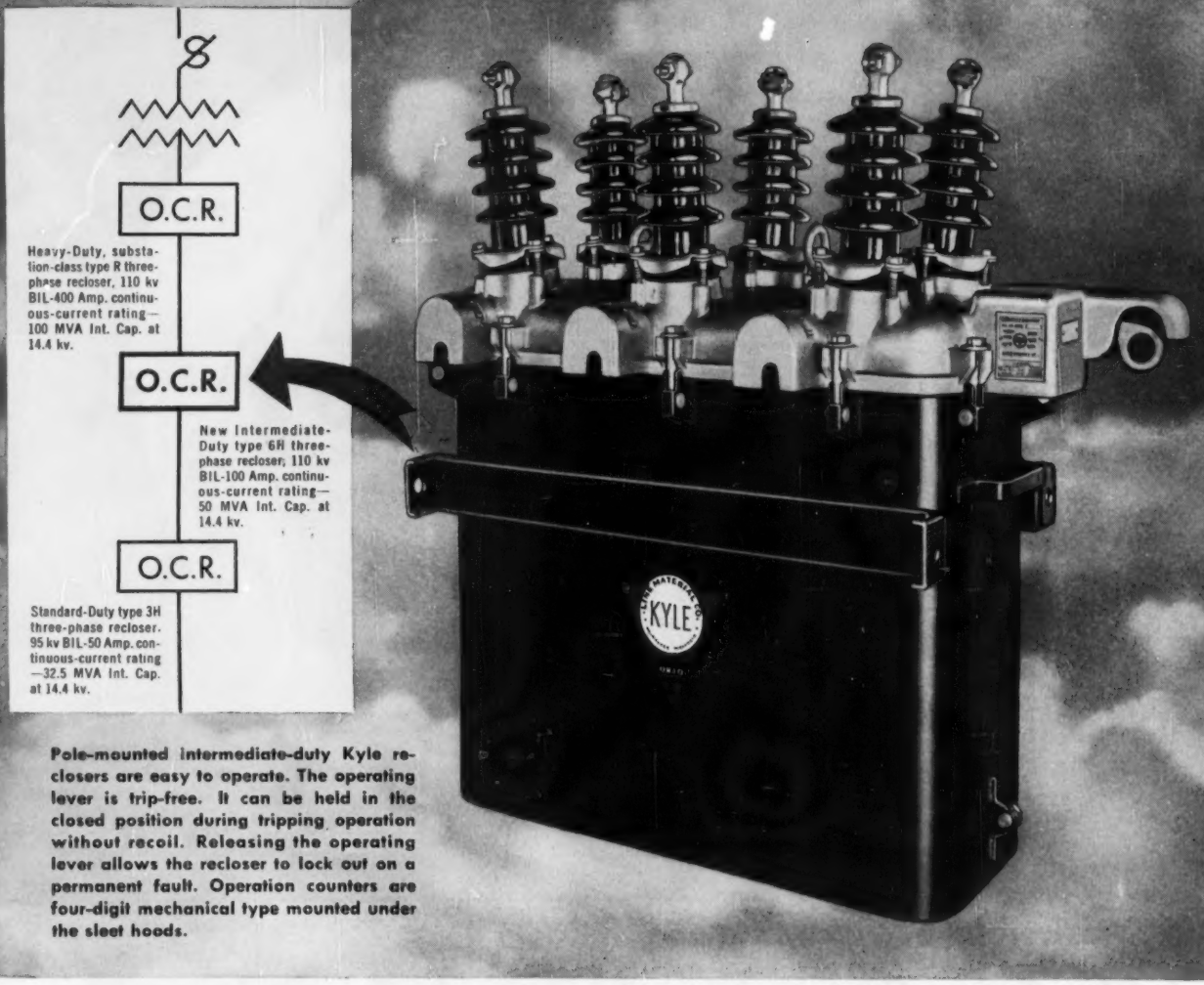
Elemex® Capacitors

247


O.C.R.
Heavy-Duty, substation-class type R three-phase recloser, 110 kv BIL-400 Amp. continuous-current rating—100 MVA Int. Cap. at 14.4 kv.
O.C.R.
New Intermediate-Duty type 6H three-phase recloser, 110 kv BIL-100 Amp. continuous-current rating—50 MVA Int. Cap. at 14.4 kv.
O.C.R.
Standard-Duty type 3H three-phase recloser. 95 kv BIL-50 Amp. continuous-current rating—32.5 MVA Int. Cap. at 14.4 kv.
KYLE

Pole-mounted intermediate-duty Kyle reclosers are easy to operate. The operating lever is trip-free. It can be held in the closed position during tripping operation without recoil. Releasing the operating lever allows the recloser to lock out on a permanent fault. Operation counters are four-digit mechanical type mounted under the sleet hoods.

L-M Announces New Intermediate-Duty Kyle® Reclosers For Overcurrent Protection

New type 6H 3-phase reclosers incorporate all outstanding features of L-M's high-speed Kyle reclosers; available in 5 to 100 ampere ratings, 2.4 to 14.4 kv; symmetrical interrupting ratings to 3000 amps. Type 4H single-phase, intermediate-duty reclosers also available.

By **WILLIAM J. WEINFURT**
Chief Engineer
Kyle Products
Line Material Company

L-M's new type 4H single-phase and type 6H three-phase reclosers are self-contained, intermediate-duty units, designed to segregate permanent faults, and to clear transient or non-persistent faults on urban and rural distribution systems. They provide high-speed circuit clearing in less than 2 cycles with symmetrical RMS interrupting ratings up to 3000 amps. 4.8 kv and below, and 2000 amps. 14.4 kv.

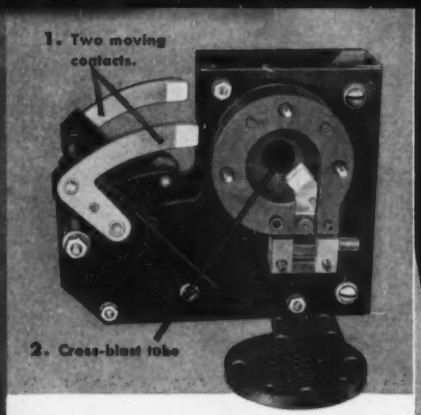
Retain Kyle Design

All the outstanding features of L-M's Kyle reclosers are incorporated in these new intermediate-duty reclosers. The timing mechanism is the service-proved Kyle hydraulic system with a selection of three time-current characteristics: Fast (A), Retarded (B), and Extra Retarded (C). Sequences can be easily adjusted for 2, 3, or 4 operations to lockout in any combination of operations. The type 6H provides single-phase tripping with operation counter for each phase, but lockout of one phase causes simultaneous lockout of all phases.

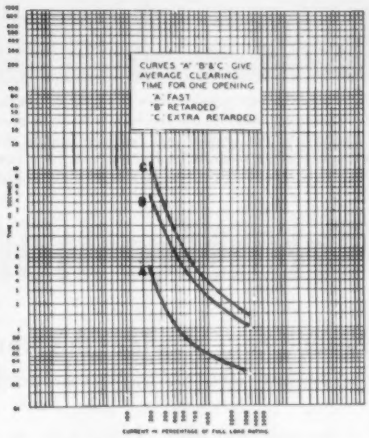
Contact Structure

Contacts and arc interrupter structure utilize the snap toggle contact action and cross-blast arc extinction principle. The cross-blast consists of two arcs drawn in series as the contacts part. Pressure

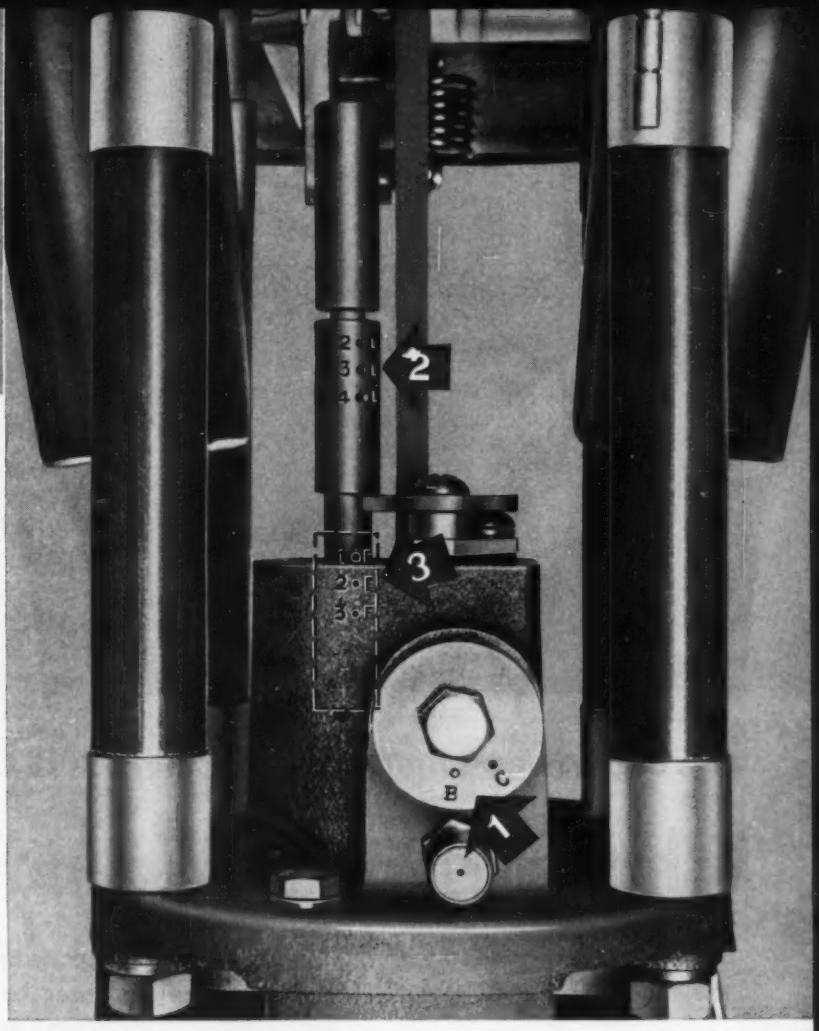
LINE MATERIAL
A McGRAW ELECTRIC COMPANY DIVISION



The new intermediate-duty reclosers utilize the service-proved cross-blast arc extinction principle. Two arcs in series are drawn as the contacts part **(1)**. Pressure generated by one arc forces oil into the path of the other arc, cooling it and extinguishing it rapidly. Note the long double-break **(2)** and cross-blast tube connecting the two interrupting chambers.



Time-Current Curves for series overcurrent tripping of L-M's intermediate-duty Kyle reclosers. Each phase of the type 6H trips individually until the final pre-selected operation, when all three phases lock open simultaneously.



Time-current characteristics and operating sequences can be easily adjusted in the field. Photo shows the hydraulic system of the type 6H recloser. Time-current characteristic is selected by moving disc to curve "B" or "C" **(1)**. Number of operations to lockout is selected by adjusting vertical extension of lockout piston **(2)**. Adjustment of sequences (number of fast and delayed operations) is obtained by the proper positioning of the roll pin located at **(3)**.

generated by one arc forces oil into the path of the other arc, cooling it and extinguishing it rapidly. Arcing time over the range of fault current ratings averages less than one-half cycle.

Moving contacts are silver-plated copper tungsten to reduce pitting and assure long life to the arcing surface. In operation, the moving contact wipes into the stationary contacts, thus insuring a cool, low-resistance, load-carrying contact. In addition, all current-carrying parts of the contacts are silver-plated.

External Construction

Terminals are universal plated type and will accommodate either copper or aluminum from No. 6 solid through 250 MCM stranded in either a vertical or horizontal position.

Bushings are wet-process, 15 kv porcelain, externally clamped to head. Bushings have approximately 12″ creepage distance. The recloser will also be available with 15″ creepage-distance bushings where desired.

Get The Whole Story On L-M's Kyle Reclosers and Sectionalizers

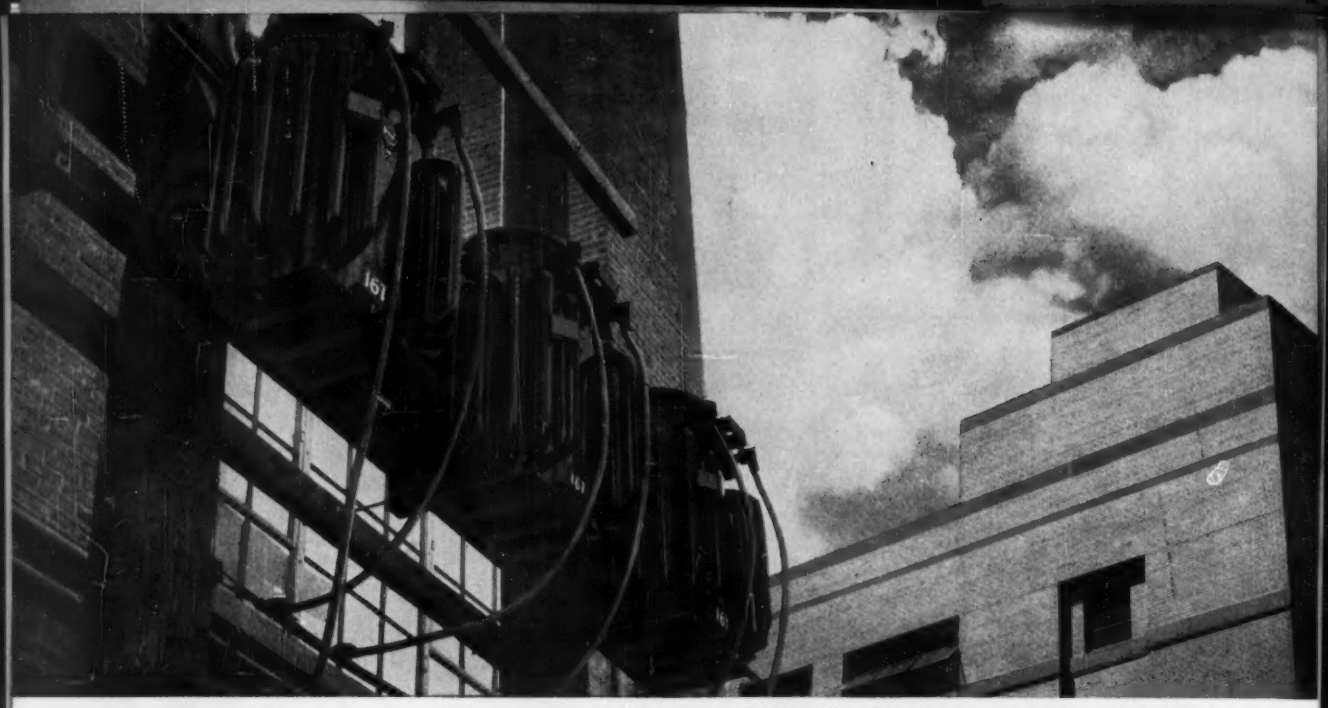
L-M offers the most complete line of reclosers—single- and three-phase—from substation to load. Ask your L-M Field Engineer for information and bulletins on Kyle apparatus and complete coordination. Or write Line Material Company, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

Kyle type 6H 3-phase reclose s available in normal load ratings FROM 5 TO 100 AMPERES*

Ratings Amps.	Min. Trip Amps.	Inter. Ratings RMS Amperes 2.4-4.8 kv	Inter. Ratings RMS Amperes 14.4 kv
5	10	200	200
10	20	400	400
15	30	600	600
25	50	1000	1000
35	70	1400	1400
50	100	2000	2000
70	140	3000#	2000
100	200	3000#	2000

*Insulation Level: 110 kv BIL.
#2,500 RMS amperes maximum Inter. rating at 8.32 kv.

Kyle® Reclosers



L-M's Round-Wound transformers provide more capacity for heavier short-time overload without sacrifice in transformer life. Because L-M's obround design is lighter, smaller, and has less bending moment than round tank design, three 167's can be hung on a two-pole structure in place of three 100 kva transformers of older design.

For Heavier Commercial Loading

Why L-M Round-Wound® Transformers

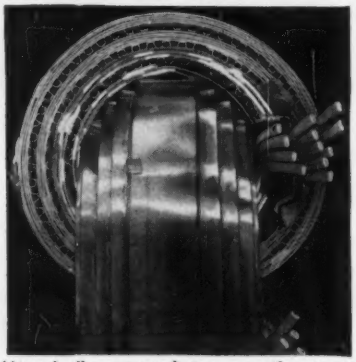
Core-type construction with cruciform cross-section core and round coils provides the most efficient design for lower hot-spot gradient, greater capacity for short-time overload.

By **ROBERT P. THOMPSON**
Manager of Engineering
Transformers
Line Material Company

One of the primary factors that limit the overload capacity of a transformer is the efficiency with which heat from the coils can be dissipated into the transformer oil. Particular care was taken, therefore, in the design of L-M Round-Wound transformers, to assure greatest exposure of coil surface area to cooling oil, and least obstruction to oil circulation.

Cruciform Cross-Section Core

The core is wound of a continuous strip of oriented steel, of varying widths, to form a core of nearly round cruciform cross section. The cruciform cross section of the core provides natural oil passages for cooling between core and coils.



Natural oil passages between cruciform core and round coil help to dissipate the heat from the coils more rapidly. In addition, ducts between windings and between layers in most sizes provide additional oil circulation.

Round Coils and Cooling Ducts

L-M's long round coils expose a relatively large and highly efficient area to cooling oil. Because of this, they provide greater overload capacity than rectangular coil types. In addition, ducts are provided for oil passages between windings and between layers in most sizes, giving exceptionally uniform cooling for the coils.

Core-Type Construction

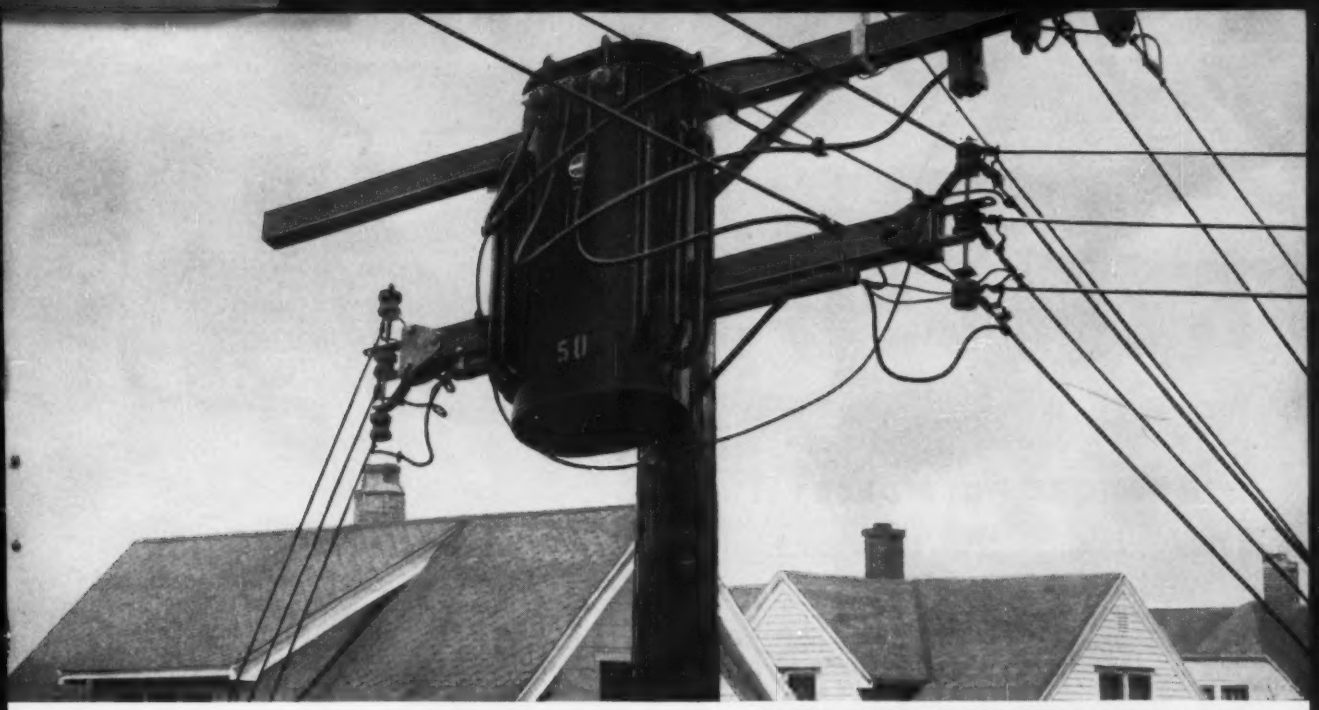
In comparison with shell-type construction, L-M's core-type Round-Wound transformer has greater outer coil surface exposed to cooling oil; therefore coils are cooled more rapidly and uniformly. The cooling surfaces of shell types are partly blanketed by core steel; oil circulation is more obstructed.

Lower Hot-Spot Temperature, Higher Overload Capacity

Because L-M's Round-Wound design provides more efficient dissipation of heat from the coils to the oil, it has appreciably lower hot-spot temperatures during overload. This permits higher short-time overload, or longer overload periods, or greatly increased over-all life of the transformer.

LM® LINE MATERIAL

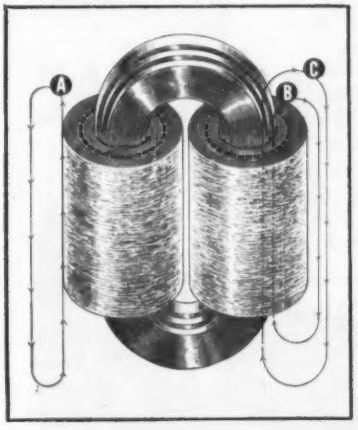
A McGRAW ELECTRIC COMPANY DIVISION



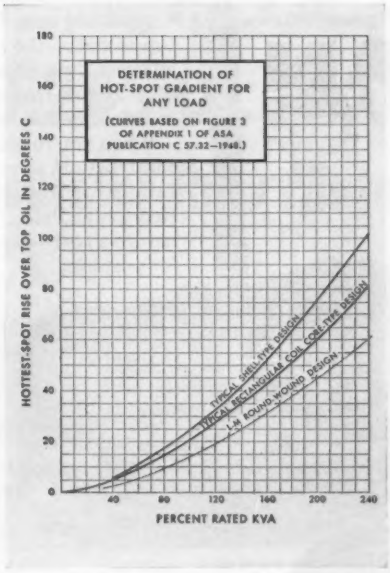
Round-Wound's high short-time overload capacity helps solve the more difficult *summer* overload problems in residential areas. The efficient cooling system in L-M transformers keeps hot-spot temperatures lower under high short-time overloads, increasing the capacity for overload and reducing the possibility of insulation damage.

For Heavier Residential Loading

Have Higher Overload Capacity



Because L-M transformers expose large, unobstructed areas to cooling oil on the outside of the coil (A), between core and coil (B), and between windings and layers (C), heat is dissipated into oil more rapidly and uniformly during overloads.



The higher the gradient at rated load, the more rapid is the rate of increase in the gradient with overload. Note that L-M's Round-Wound transformer, with a *lower* temperature differential (gradient) between hot-spot and top oil at rated load, has a greater capacity for overload.

Five Reasons Why More Customers Are Selecting L-M Round-Wound Transformers

1. Higher Uniform Impulse Level: Round coils are *wound* into shape. Therefore insulation is not damaged by malleting into rectangular shape. Coils have longer creepage distance between windings and between leads.

2. Higher Short-Circuit Strength: Round coils are not stressed out of shape under high radial short-circuit forces. Strong steel frame, heavy clamping bolts, sturdy maple blocks and varnished coils prevent axial movement.

3. Higher Short-Time Overload Capacity: Round coils and the cruciform cross-section core expose large surfaces to cooling oil. The result is relatively low hot-spot temperatures, which add considerably to high short-time overload capacity.

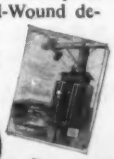
4. Balanced Performance: The core is a continuous wound strip of oriented steel. Coils are wound directly onto this core. Since the core is not cut, unwound, or disturbed in any way after annealing, there are no air gaps to break up the flux path. This results in low exciting current and core loss.

The wound-core, round-coil design permits fewer winding turns and smaller turn diameter. This results in low impedance, and provides better regulation at all power factors.

5. Additional Capacity on Pole: L-M's new obround tank design makes the unit smaller and lighter, with shorter moment arm from the pole. This combination reduces the bending moment on the pole and crossarms, and thus greatly increases the potential capacity of existing transformer structures.

Get Complete Information

Ask your L-M Field Engineer for complete information on L-M's Round-Wound design, and bulletins. Or write Mr. Thompson at Line Material Company, Transformer Division, Zanesville, Ohio.



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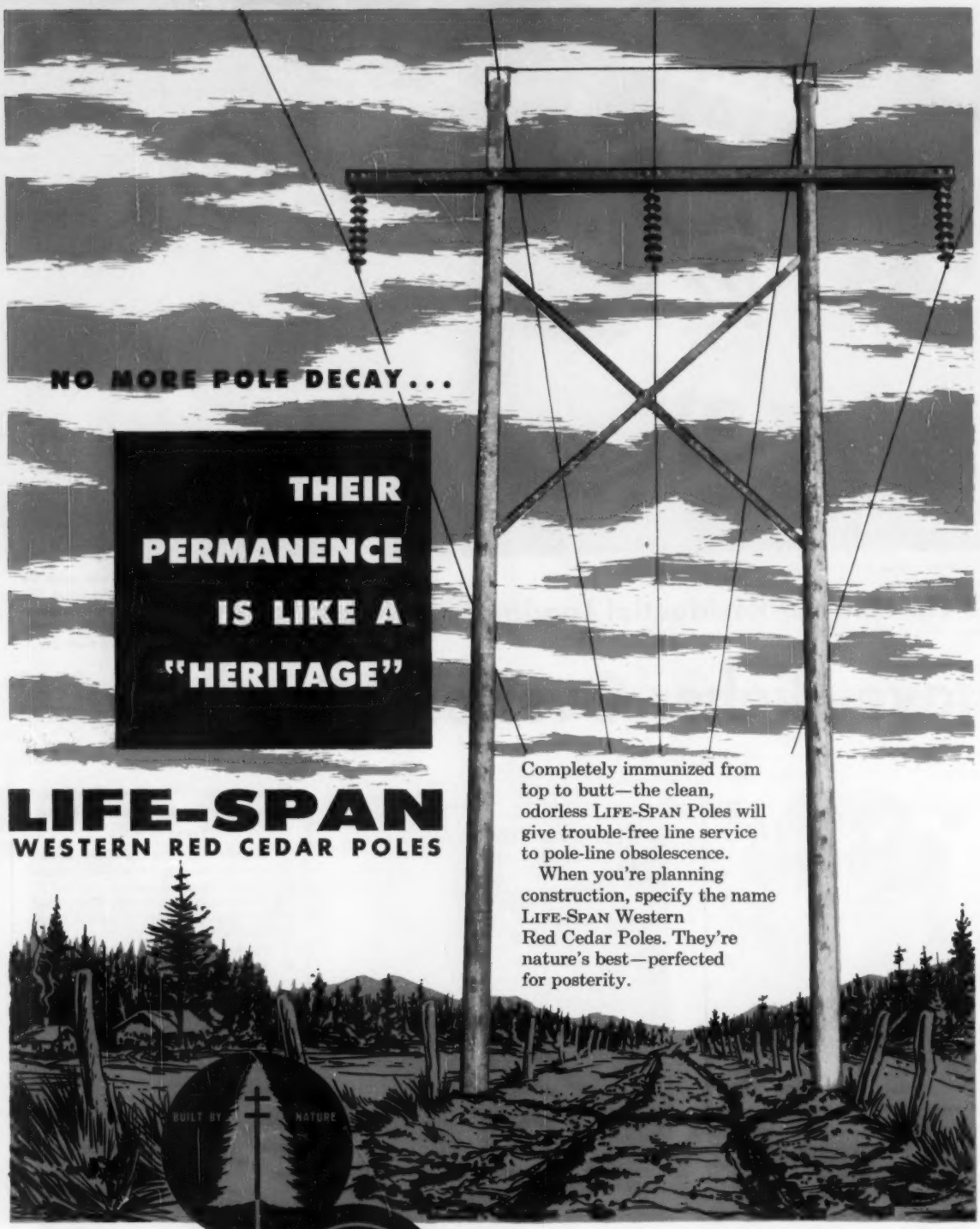
Transformers


NO MORE POLE DECAY...
THEIR PERMANENCE IS LIKE A "HERITAGE"
LIFE-SPAN
WESTERN RED CEDAR POLES
Completely immunized from top to butt—the clean, odorless LIFE-SPAN Poles will give trouble-free line service to pole-line obsolescence.
When you're planning construction, specify the name LIFE-SPAN Western Red Cedar Poles. They're nature's best—perfected for posterity.
BUILT BY NATURE
Life Span

Write for complete information

PAGE & HILL, INC.

MINNEAPOLIS 3, MINNESOTA

Keeping track of

$5Al_2O_3.2MgO.24SiO_2.6H_2O.Na_2O.CaO$

...in Insulator Raw Materials

The complex formula above stands for "Montmorillonite", one of a group of highly plastic minerals present in the clay which is a component of every insulator. As these little known minerals contribute properties to the clay which are most important when it is formed into insulators for your power system, it is necessary to determine their presence and quantity in raw materials coming to us from the mines.

In the past, it has been difficult to make fast, positive identification of these fine clay fractions . . . even by such means as the petrographic microscope and X-ray diffraction.

Today, however, General Electric is pioneering the application of Differential Thermal Analysis (DTA) in this small but important phase of Locke* insulator manufacture. DTA is a reliable system for determining minerals in ceramic materials by interpreting differences in heat absorption and emission during firing between a test sample and a known inert material. These are recorded by the graph you can see in the photo. With DTA, another scientific method is added to mass production of fine electrical porcelain.

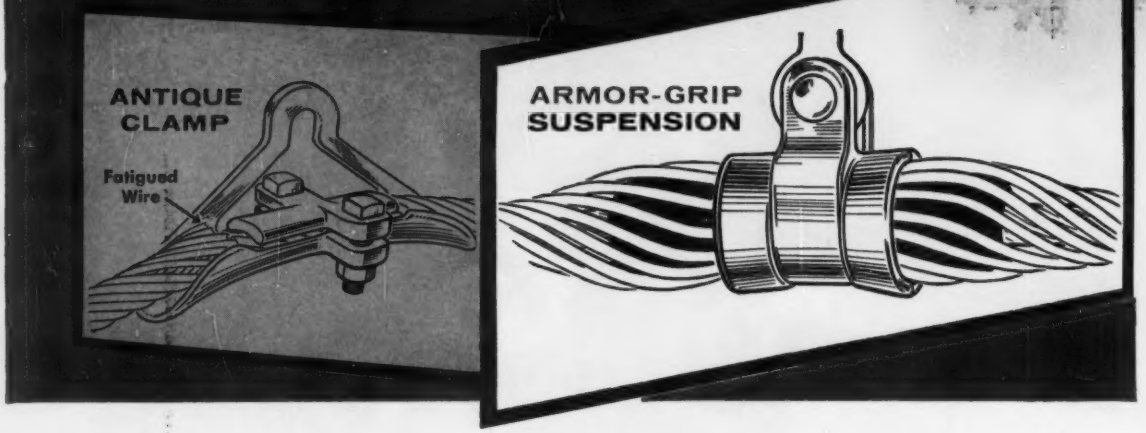
DTA is another illustration of the extremes to which we go to make sure you get Locke insulators of uniform density, high mechanical strength, dimensional accuracy and long service life. Insulator Department, General Electric Company, Baltimore, Maryland.

*Registered Trademark of General Electric Company.

Progress Is Our Most Important Product

GENERAL ELECTRIC

"PERFECTING



"they both suspend the conductor, BUT . . ."

. . . yesterday's answers are not good enough. Today's will need improving tomorrow.

Take the problem of vibration fatigue. Failure of strand because of vibration or galloping does not occur in mid span. But it becomes a real problem at points of stress concentration, such as the end of the clamp keeper—at mass concentrations, such as at clamps, dampers and rigid splices—or at wearing points at loose attachments or fastenings.

Yesterday's answer—Preformed Armor Rods, introduced by Preformed Line Products Company in 1947.

Today's answer—PLP Preformed Armor with pitch direction the same as conductor strand and pitch length less than that of strand (Patent No. 2,609,653). When used in conventional clamps:

- it extends uninterrupted conductor life
- it eliminates wear possibilities
- it prevents excessive mass and stress concentrations

Tomorrow's answer is here today: the Preformed armor rod principle carried one step further in Preformed's ARMOR-GRIP SUSPENSION (Patent No. 2,722,393), the entirely new concept in suspension design.

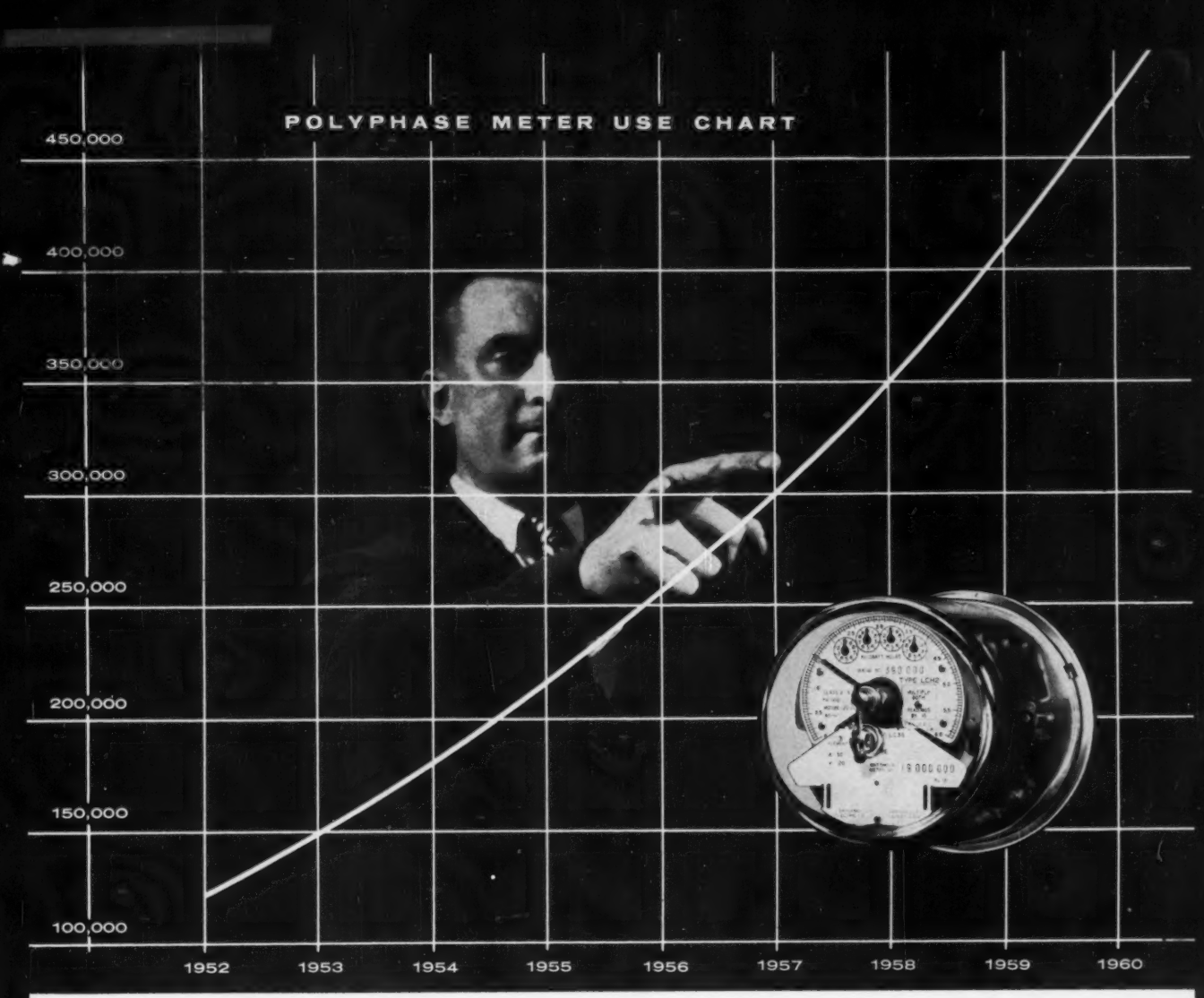
The Armor-Grip Suspension Unit is a "floating suspension"—the conductor is cradled in neoprene and firmly gripped only by the custom-designed Preformed Rods which distribute their pressure over a relatively large area. The result: no wear possibilities—no mass concentrations—*and no clamping stress concentrations.*

This is another example of PLP research laboratories at work. Ever improving methods, materials and solutions is our goal. Call a PLP Representative today and ask for a demonstration.

* *John Dewey, "The Reconstruction of Philosophy"*

Made in accordance with or for use under one or more of the following U. S. Patents: 2,722,393; 2,275,019; 2,587,521; 2,609,653; 2,691,865; other patents pending.

PLP PREFORMED LINE PRODUCTS COMPANY



Polyphase meter usage going up!

For a polyphase future use Sangamo single disk meters

Polyphase metering is on the march. From past records it appears that the use curve of polyphase meters will reach 500,000 annually by 1960! Better look to your polyphase meters . . . now.

All Sangamo Polyphase Meters—2, 2½ *and 3 element*—are single disk meters. The 3 element meter takes no more wall space than the 2 element meter. When you change to 4 wire Y, you will find the 3 element meter fitting in where the 2 element meter was before.

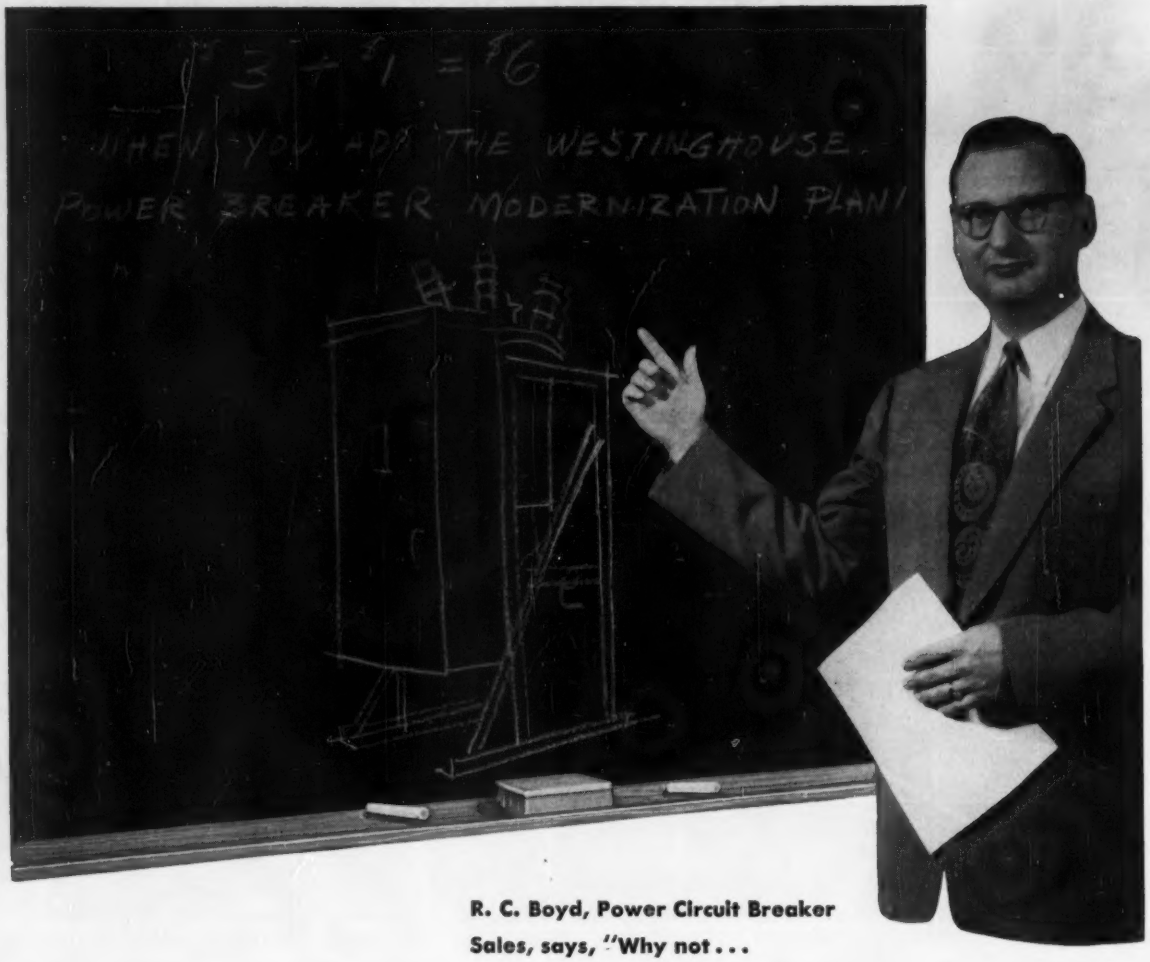
The LC meters are high torque meters, ruggedly made for the polyphase loads of today and tomorrow.

Plan for a polyphase future—with Sangamo.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

SM56-7



R. C. Boyd, Power Circuit Breaker Sales, says, "Why not . . .

uprate breakers at 1/3 new equipment cost"

Here's a way to double the value of breakers in place—at one third the cost of new equipment.

It's simple, and your Westinghouse sales engineer can give you the details quickly. When he knows the style and rating of your present breakers, he can suggest the proper interrupter replacement that will step up the capacity of your breakers 50 to 200%. You make the installation. No need to relocate or remount equipment. That's all there is to it.

In addition to keeping breaker capacity up and equipment investment down, you get additional benefits with new Westinghouse interrupters which will improve the quality and economy of breaker operation. The exclusive magnetic, multi-flow or tubular De-ion® grid interrupters extinguish arcs faster than ever before, which means less oil deterioration, less maintenance.

So, if you need one or more breakers that your budget won't allow, the Breaker Modernization Plan can probably solve your problem. Look into it. Call your Westinghouse sales engineer now, or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60879

YOU CAN BE SURE... IF IT'S Westinghouse

FOR SUPERIOR INSULATION AND JACKETING
CHOOSE ALATHON® POLYETHYLENE RESIN

The unique properties of ALATHON polyethylene resins make them suitable for both jacketing and insulating applications. Jacketing of black ALATHON withstands conditions of heat, moisture, and weather extremes – assures years of trouble-free service. ALATHON absorbs the shocks of rough handling and thereby speeds installation.

The electrical properties of ALATHON polyethylene resins are excellent. Their low power factor and dielectric constant remain essentially unchanged over a wide range of frequencies and temperatures. Their moisture resistance and lightness of weight make them eminently suitable for insulating applications.

A complete family of ALATHON polyethylene resin compositions is offered by the Du Pont Polychemicals Department. For the compound best suited to your particular use, send for complete details by mailing the coupon below.

Jacketing of ALATHON®
— for greater durability
— for abrasion resistance
SHIELD
Insulation of ALATHON® for high dielectric strength and heat resistance

There is a difference in polyethylenes—

specify ALATHON®
polyethylene resin

DU PONT

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

E. I. du Pont de Nemours & Co. (Inc.)
Polychemicals Department
Room 858, Du Pont Building, Wilmington 98, Delaware

Please send me complete information on Du Pont "ALATHON" polyethylene resins. I am interested in evaluating these materials for

.....

.....

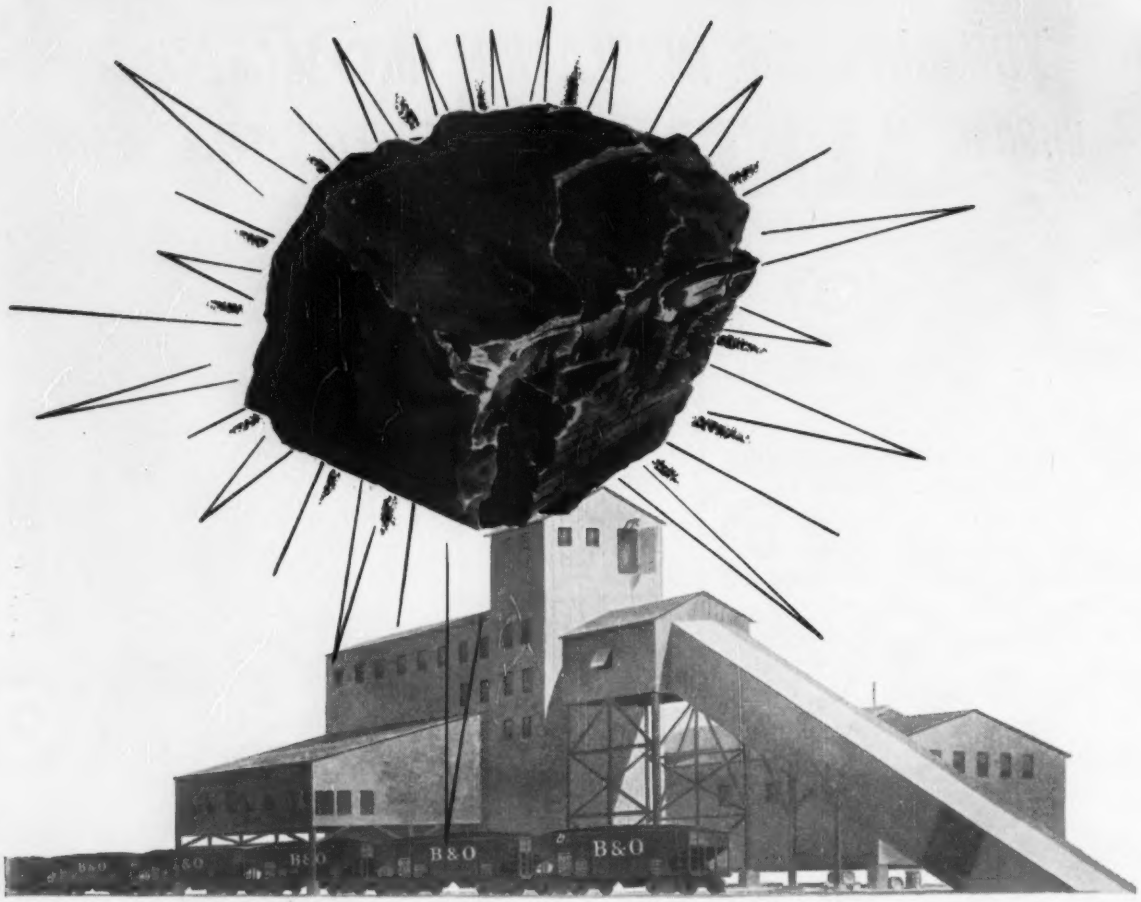
*Name*_____ *Position*_____

*Firm Name*_____

*Street Address*_____

*City*_____ *State*_____

*Type of Business*_____



Energy Unlimited!

BILLIONS OF TONS OF LATENT POWER... READY TO MEET THE FUTURE'S NEEDS

➔ Bituminous coal offers the nation a priceless commodity —a virtually untapped source of low-cost power. The B&O serves areas with proved *usable* reserves containing billions of tons of this *fuel with a future*, convenient to industry's heaviest concentration.

As population grows and living standards soar, the added energy requirements can easily be met by B&O Bituminous. In addition, its modern mining and utilization will assure greatest efficiency at stable, low cost. *Ask our man!*

LET OUR COAL TRAFFIC REPRESENTATIVE HELP YOU!
He will gladly suggest the perfect constant-low-cost Bituminous coal for your particular needs.
COAL TRAFFIC DEPARTMENT B&O RAILROAD
Baltimore 1, Md. LExington 9-0400

BALTIMORE & OHIO RAILROAD

WHAT

BLACKBURN

HAS

UP

ITS

SLEEVE!

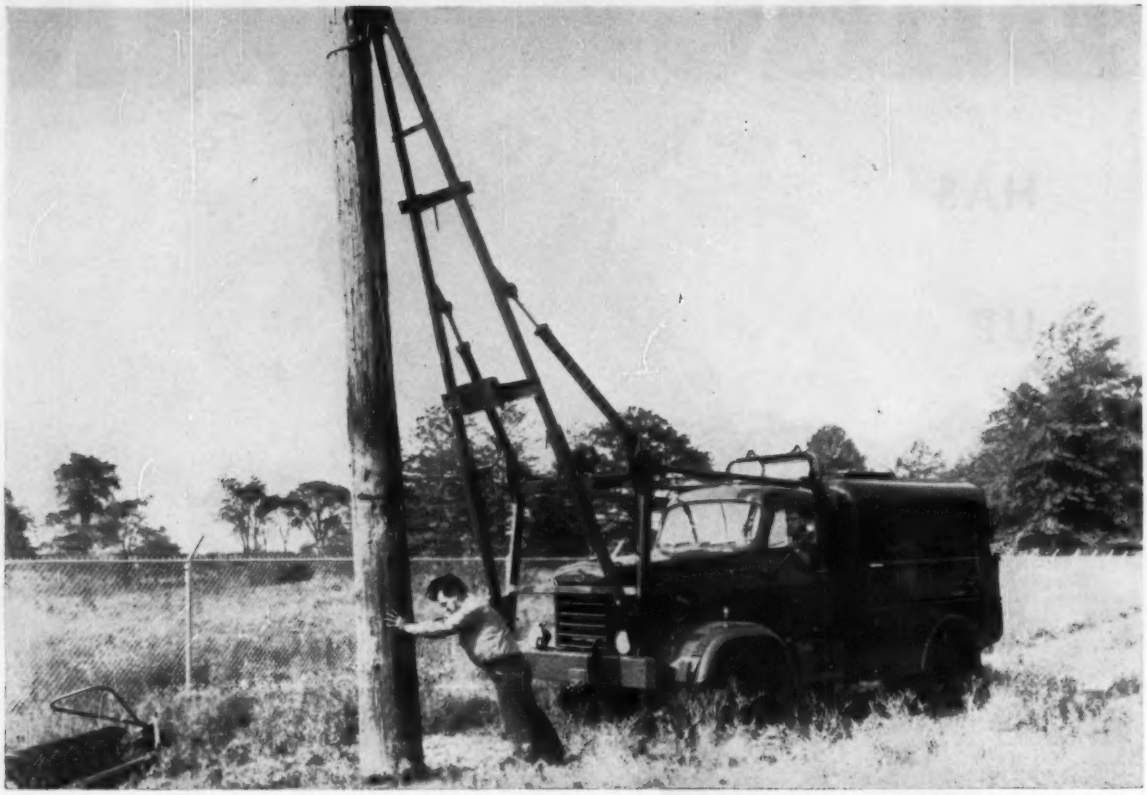
Blackburn Compression Service Entrance Sleeves Feature

- Body of highly conductive aluminum that fits all standard compression tools. Can be used for all combinations of aluminum ACSR and copper conductors.
- Bores of each tube are filled with CONTAX, a mineral base grease with metallic and abrasive particles held in suspension. It has an ASTM drop point of 549° F.—improves conductivity—prevents corrosion.
- Solid metal barrier between bores assures even distribution of CONTAX all around conductors when crimps are made.
- Push conductor through thin wall, color coded caps—no need to remove them before inserting conductor—they do not interfere with installing die. Colors will not run or fade. Sizes cover a wide range of conductor combinations.

Available at Electrical Wholesalers Everywhere.
Wire or write for bulletin on Blackburn Compression Fittings.

JASPER BLACKBURN CORPORATION 35 MADISON ST. • ST. LOUIS 6, MO. • PHONE MAIN 1-2821

New FWD 2-Man "Rhino" Does 5-Man job in less time



HERE'S DEMONSTRATED PROOF: In the toughest kind of utility job tests, the new FWD "Rhino" has repeatedly proved it can dig more holes, set more poles . . . with fewer men!

The rugged-built "Rhino," with FWD's special power and weight proportioning, makes it practical to handle massive front-end loads . . . has the only *true* "full-time" four wheel drive. Equipped with a heavy-duty 9500 lbs. front axle, the "Rhino" carries front-mounted derrick and digger through the toughest kind of off-highway terrain.

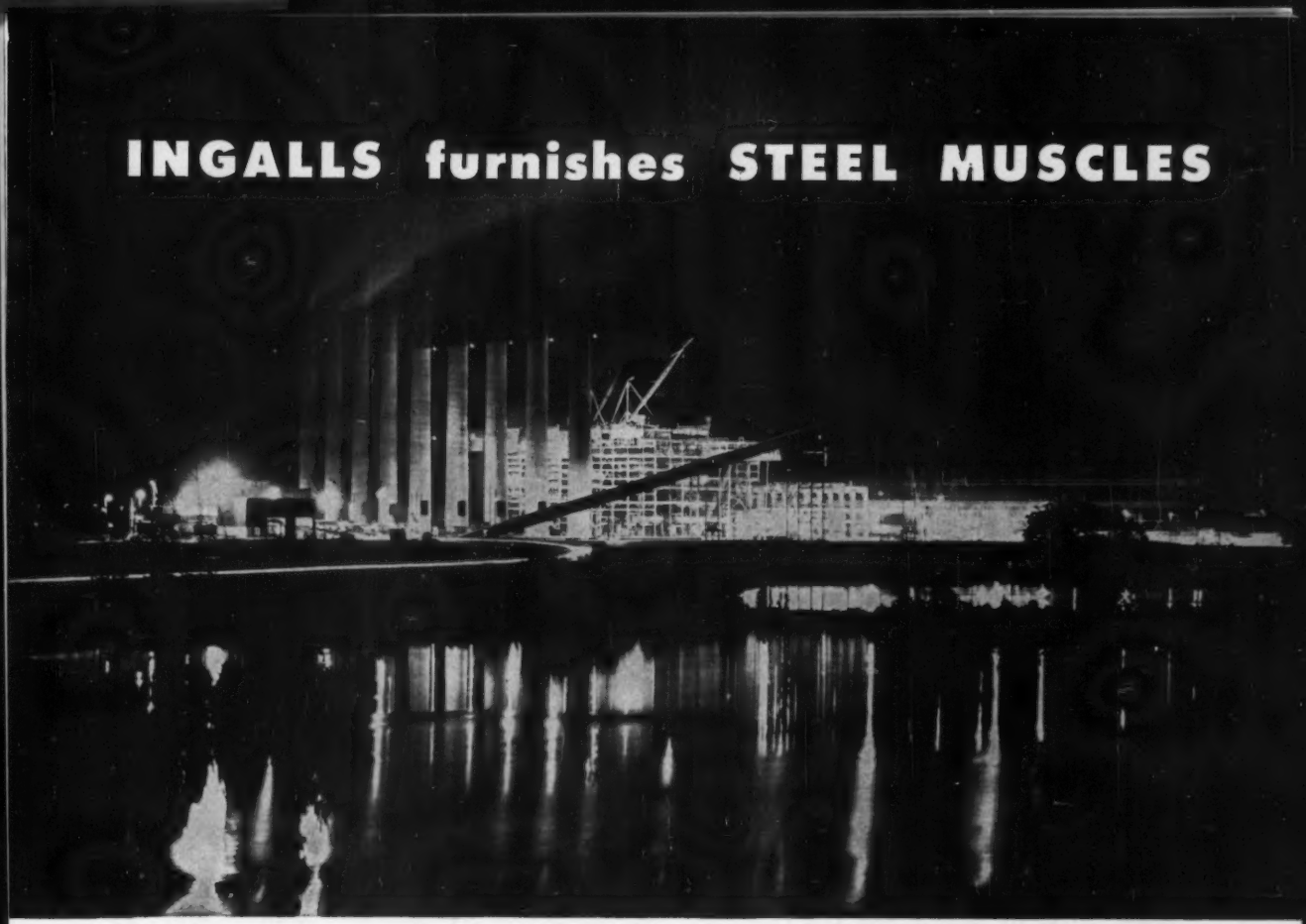
The "Rhino" gives the driver full visual control at all times. No need to jockey back and forth. He just drives into position where the second man handles the digger or positions the pole. In any terrain, these two men will dig more holes, set more poles than five men . . . in less time!

FWD

Heavy-Duty Vehicle Specialists

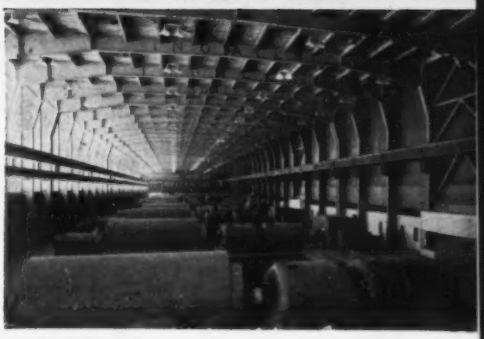
THE FOUR WHEEL DRIVE AUTO COMPANY • **Clintonville, Wisconsin** • *Canadian Factory* • KITCHENER, ONTARIO

INGALLS furnishes STEEL MUSCLES



for the WORLD'S LARGEST POWER PLANT

This is the world's largest steam-electric plant, recently completed near Kingston, Tennessee, by the Tennessee Valley Authority. The entire plant has a capability of one million, six hundred thousand kilowatts — about fourteen times that of Norris Dam. With a generator room 895 by 115 feet, a boiler room 868 by 138 feet, and a shop and office area 200 by 205 feet, the main building of the nine unit structure is by itself tremendous; some idea of the whole plant's scope may be realized by considering the twenty two million man hours that went into planning, designing, construction, and secondary services.



View of turbine room in Ingalls-fabricated powerhouse; 7 units in operation; 150,000 kw units in foreground

INGALLS, specialist in steel for power plants, is genuinely proud of having been called upon to fabricate the structural steel used in the powerhouse proper for this monumental operation. It represents one more in a large series of power installations done by Ingalls in twenty two different states, throughout the North, South, East, and Southwest. Wide and intense practical knowledge makes Ingalls ready *now* to help you with both speed and true economy. Your inquiries will be promptly acknowledged.

FABRICATING STEEL IS OUR BUSINESS

THE INGALLS IRON WORKS COMPANY
BIRMINGHAM, ALABAMA

SALES OFFICES: New York, Chicago, Pittsburgh, Houston, Atlanta, New Orleans

PLANTS: Birmingham, Ala.; Verona, Pa.; Pascagoula, Miss.; North Birmingham, Ala.; Decatur, Ala.

EXTRA MILES...

WITH PEAK MOBILE RADIO POWER

★ 100 WATT POWER OUTPUT ★ MAXIMUM RANGE
★ EXTENDED COVERAGE ★ TOP RECEIVER SENSITIVITY

Motorola "TWIN-V" radiophone—with highest power, to push the range of your VHF radio system to its maximum—to optimize mobile-to-base and mobile-to-mobile communications in the farthest fringe areas.

Here peak receiver sensitivity combines with highest transmitter output to assure dependable reception of all communications. Advanced design provides full 100 watt rated output. Yet the economical battery drain is comparable to conventional 60 watt equipment—plus full 6/12 volt interchangeable operation, without changes or modifications, for obsolescence protection in mixed fleets.

The 25-54 mc. 100 watt mobile radio equipment includes all the forward-looking engineering of the "TWIN-V" radiophone line:

- Conservative long-life design
- Reserve performance
- Minimum maintenance requirements
- "On-channel" stability
- Crisp, clear voice reproduction
- Rugged construction
- Dependability through the years

Twin-V RADIOPHONE 6 V 12

These and many other features have made "TWIN-V" radiophone the choice of most mobile radio users—features which become more strikingly evident as experience continues to prove their merits.

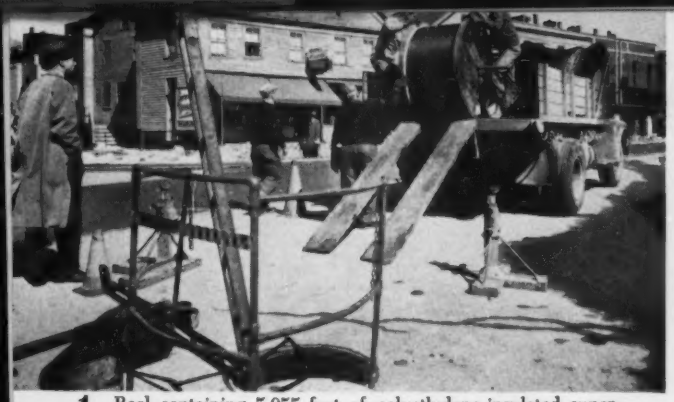
And Motorola is your *complete* supplier—with the proper equipment for every radio system, plus parts, maintenance, financing, service and engineering available for every application. Write, phone or wire—TODAY!

MOTOROLA

2-WAY RADIO

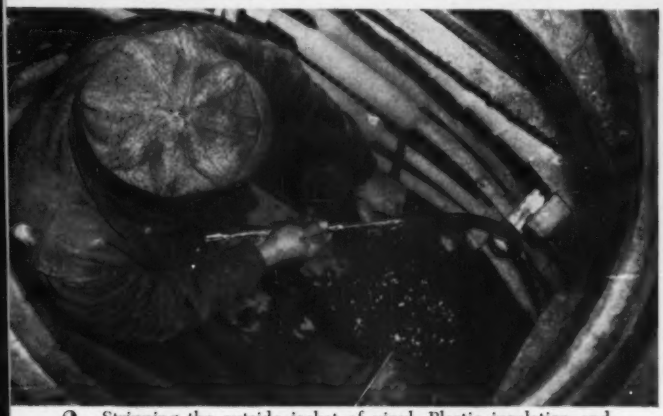
MOTOROLA COMMUNICATIONS & ELECTRONICS, INC.
A SUBSIDIARY OF MOTOROLA, INC.
4501 AUGUSTA BOULEVARD • CHICAGO 51, ILLINOIS

Motorola consistently supplies more mobile and portable radio than all others combined.
Proof of acceptance, experience and quality.
The only COMPLETE radio communications service—specialized engineering . . . product . . . customer service . . . parts . . . installation . . . maintenance . . . finance . . . lease.
"The best costs you less—specify Motorola."



1. Reel containing 5,055 feet of polyethylene-insulated supervisory cable being unloaded.

2. Making pig-tail splices on the polyethylene-insulated conductors. Operation took about half hour for 16-pair cable.



3. Stripping the outside jacket of vinyl. Plastic insulation and jacketing are easy to strip for fast splicing.

4. Soaping the cable to aid in pulling. Average length was 1000 feet, pulled by hand.

Worcester, Mass.—

Major utility installs polyethylene-insulated supervisory cable

These pictures show some steps in making one of the largest installations of supervisory cable for speeding location of faults in tie lines. Installation was made by Worcester County Electric Co., subsidiary of New England Power Co. It connects two substations with each other and the central generating station.

The cable has 16 pairs of No. 19 gauge conductors, each insulated with moisture-resistant BAKELITE Brand Polyethylene, with an outer jacket of tough, abrasion resistant vinyl plastic. The cable operates relays at opposite ends of the tie lines so that lines can be cleared in case of trouble.

Crews worked twice as fast as with earlier cable because the plastic construction makes this cable lighter, smaller, and easier to splice. Greater lengths were pulled through—the average was 1000 ft.—and pulling was by hand. Only a quarter of the usual splices were needed, each taking about half an hour.

BAKELITE Brand Polyethylene is being used extensively on utility line wire, service drop, power cable, and coaxial cable. It satisfies REA requirements for plastic-covered telephone wire, meets applicable IPCEA specifications for service drop cable, ASA standards for weatherproof wire, ASTM D1238-52 Type II, dielectric materials, and IMSA specifications for fire alarm and signal control cable.

Cable shown is "Ankoseal" manufactured by **The Ansonia Wire & Cable Co.**, Ashton, R. I.

BAKELITE BRAND PLASTICS

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.

In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario

The term BAKELITE and the Trefoil Symbol are registered trade-marks of UCC

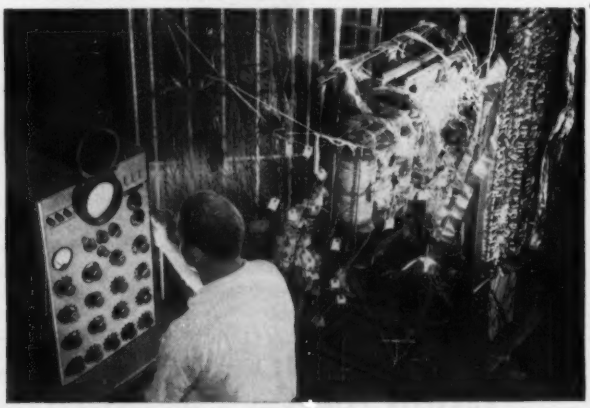
OPTIMUM INVESTMENT*
Power Transformers

*Optimum Investment

Your assurance of lower long-term cost, plus greater dividends from your investment in General Electric large power transformer, through:

- **LOW ENGINEERING COST:** G-E field services reduce your engineering expense.
- **LOW PURCHASE COST:** Skill to produce optimum design for each application.
- **LOW INSTALLATION COST:** Upright shipment, one-piece tank speeds handling.
- **LOW OPERATING COST:** Permanent, better characteristics for lasting economy.
- **LOW MAINTENANCE COST:** Product improvements, greater reliability reduce outages.

INTERNAL THYRITE*, an amazing non-linear resistance material, gives ideal overvoltage protection to partial or complete sections of transformer windings. Located next to and connected in parallel with the coil, Thyrite acts like a safety valve and by-passes excessive currents and voltages.



ELECTROMAGNETIC MODEL determines impulse voltage distribution in a transformer before the actual unit is built. Due to remarkable similarity in characteristics between model and completed transformer, the unit can then be built with the correct amount and location of insulation.

Improvement of Power Transformer Design Features Leads to . . .

A 300% INCREASE IN RELIABILITY; UTILITY SAVINGS OF $10,000,000 IN 1955

Product improvements speed trend to three-phase units, reducing utility capital investment in transformers

How reliable are today's power transformers? A recent study indicates that General Electric power transformers have become three times more reliable in just twenty years.

ANALYSIS OF RECORDS was made to determine how many transformers, 15,000 KVA and above, succumbed to lightning or faults within the first five years of service. Transformers built in two periods—1928 through 1930, and 1948 through 1950—were compared. G-E records show that the number of failures, already small, was further reduced by 75% on the basis of the number of units shipped, and 84% on a KVA-shipped base. Also, since 1950, further product improvement has reaffirmed this 300 per cent increase in power transformer reliability.

During the late '20's, many installations consisted of single-phase, rather than three-phase units. As transformers became more reliable, the trend to three-phase installations grew, saving users of General Electric power transformers over $10,000,000 in 1955 alone—comparing units actually purchased to what would have been bought based on the utility practices of the late '20's.

EXTENSIVE DEVELOPMENT of new and better G-E power transformers features has keynoted this trend. For instance, Thyrite* resistors help guard against winding overvoltages caused by line surges; electrostatic shielding helps prevent damage from lightning impulses; electromagnetic models assure the use of proper impulse-resisting insulation; and special core and coil bracing keeps the unit rigidly strong. All contribute to improved reliability.

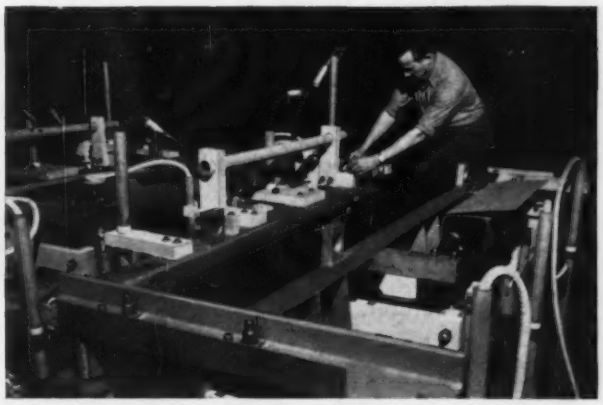
These are examples of features designed to reduce your maintenance costs. There are more. And, combined with other features that give you low engineering, purchase, installation, and operating costs, they make your General Electric Power Transformer an *Optimum Investment.* General Electric Co., Schenectady 5, N. Y. 421-44

*Registered Trademark of General Electric Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC

ELECTROSTATIC SHIELDING combats the tendency of lightning-caused impulse voltages to overstress the insulation by distributing themselves across only a few turns of the winding. Shielding evens out the voltage distribution throughout the winding and helps prevent insulation breakdown.

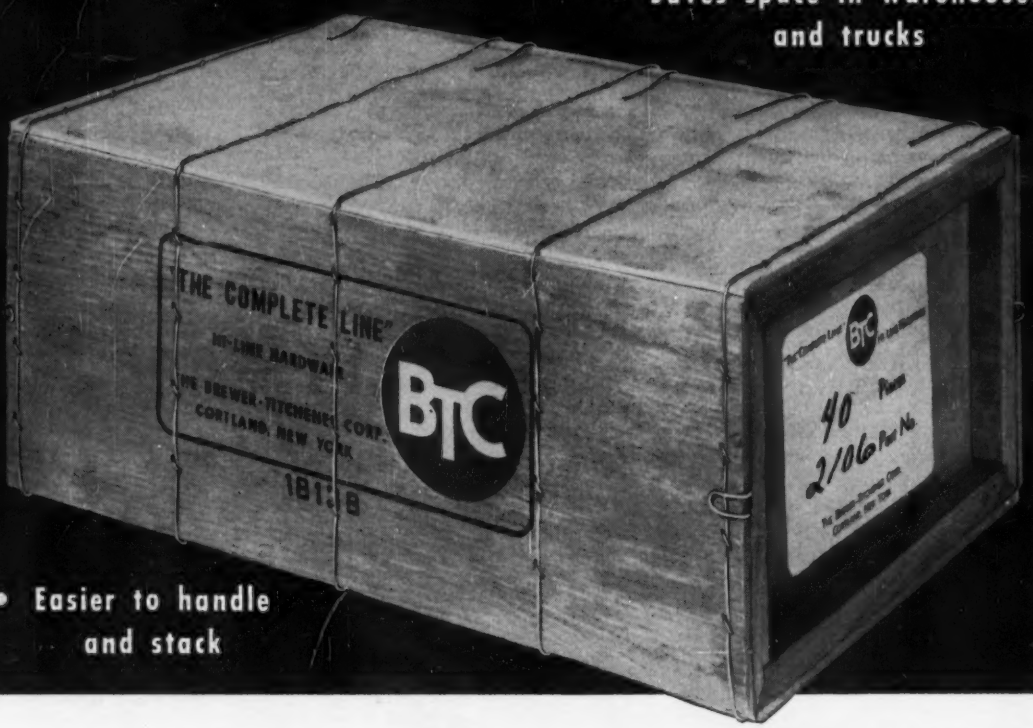


CORE AND COIL CLAMPING forms a rigid, compact structure of the myriad of component parts of the assembly. As surges and fault currents course through a transformer, exerting severe stresses on the assembly, the clamping resists these forces and helps protect the assembly from being distorted or damaged.

COMPACT NEW PACKAGE...

for BTC Drop-Forged Hi-Line Hardware

- Saves space in warehouses and trucks



- Easier to handle and stack

- Simple identification and inventory

BTC HI-LINE HARDWARE now comes in husky wire-bound wooden boxes. Gone are cumbersome, hard-to-handle bags. These compact boxes stack easily in storage . . . save space in warehouses, on trucks . . . decrease handling costs.

Light enough for one man to handle, the new BTC boxes are clearly labeled to simplify inventory-taking and checking. The label tells the quantity and number of parts inside for fast, easy identification.

Look for these new boxes on your next shipment of BTC Drop-Forged Hi-Line Hardware . . . another reason why it pays to specify BTC Hardware from your insulator manufacturer.

THE BREWER-TITCHENER CORPORATION

Cortland, N. Y.

...listen to a really quiet 2-pole motor!

No longer must large 2-pole induction motors be considered the noisy nuisances of the electric motor family. The new *"super-quiet"* Elliott 2-pole design creates a *quality* and *level* of sound that will offend neither operators nor neighbors.

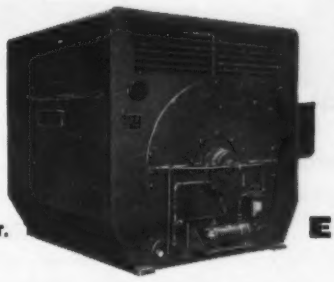
The Consulting Engineers and Utility Executives who watched and listened to an experimental 2000-hp "super-quiet" motor agreed, without exception, that they were hearing the quietest 2-pole motor of its size yet developed.

This solution to the problem of excessive noise was developed by Elliott after many years of trial and test. The answer was found in details of rotor and stator design – electrical, magnetic, and mechanical.

These design details combine to reduce objectionable *high-pitch* noise at its source. And the ingenuity of the ventilating system helps to baffle and absorb the internal noises, containing them within the motor.

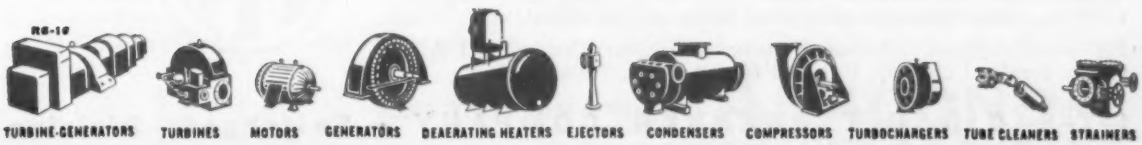
The latest design of the Elliott "super-quiet" motor, shown below, differs somewhat from the experimental version above, achieving the same result in a neater, more attractive package. Note the filtered air inlets in the sides of the motor enclosure.

To all interested engineers we say, sincerely, "Hearing is believing." A demonstration of the "super-quiet" motor can be arranged through your Elliott representative. Or write Elliott Company, Ridgway Division, Ridgway, Pa.



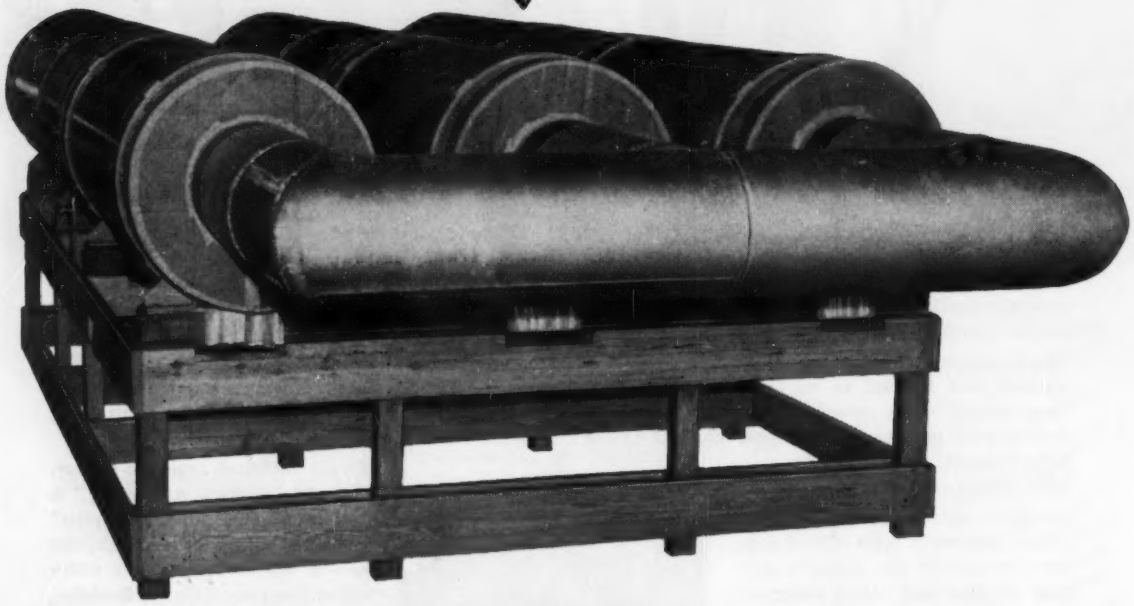
Latest design 2500-hp "super-quiet" motor.

ELLIOTT Company



First 10,000 amp **self-cooled** isolated phase bus ever built

I-T-E 10,000 amp self-cooled isolated phase bus in laboratory for thermal test.



. . . design eliminates auxiliary forced-air cooling equipment

Now you can get heavy current isolated phase bus of this rating and above without having to buy and maintain auxiliary equipment to cool it.

I-T-E design includes:

- All aluminum conductors
- Connectors—bolted or field welded
- Covers—telescoping type; split halves, bolted or field welded

For more complete information, write Switchgear Division, I-T-E Circuit Breaker Company, 19th and Hamilton Sts., Phila. 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division

New demonstrator unit of Anaconda's slotted-stem Soldersealed Pothead shows how these potheads give you a sounder connection now—simplify relocation later.

Ask the Man from Anaconda to demonstrate slotted-stem Soldersealed Potheads to you

When the Man from Anaconda demonstrates how the slotted-stem* Soldersealed Pothead assembles, you will see quickly and clearly for yourself how it:

1 Prevents misalignment of the cable during wiping and filling operation . . . is easiest to install.

2 Produces *permanent*, sure electrical connection.

3 Eliminates possibility of faulty field connection because of *double* action.

4 Is easy to disassemble and reassemble for relocation.

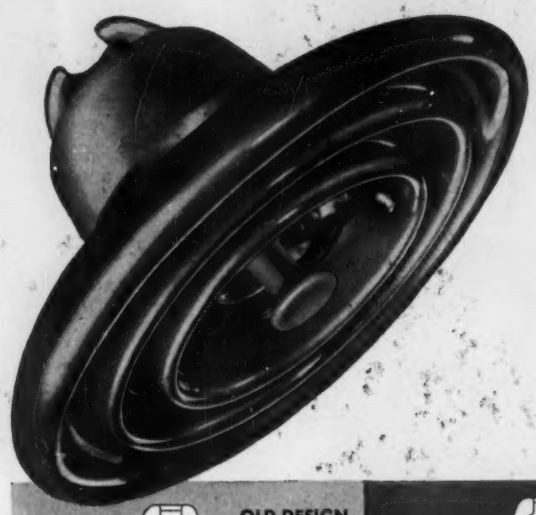
5 Is 100% salvageable—without repairs on the hood.

Every Anaconda Wire & Cable Company district sales office has been supplied with special demonstrator units that fit into a briefcase for showing *in your office*. Ask your Anaconda representative to demonstrate this exclusive Soldersealed Pothead to you the next time he calls.

Anaconda Soldersealed Potheads are available in 1/C type up to 46kv for indoor or outdoor service—stocked, ready for delivery. Now obtain both your power cable and Soldersealed Pothead from Anaconda. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York. *Pat. applied for 56369

ASK THE MAN FROM ANACONDA®
FOR SOLDERSEALED POTHEADS

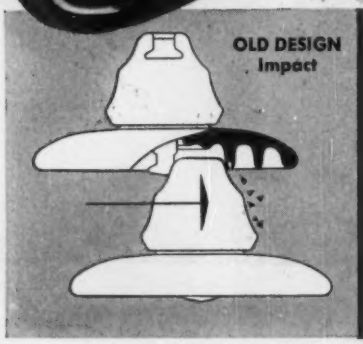
TIME-TESTED AND FIELD-PROVED



Thomas

"CHIP-PROOF" INSULATORS*

- *eliminate impact*
- *eliminate breakage*



A close look at the two drawings points out the reason why. The Thomas design eliminates the cause of breakage. It prevents impact. Eliminate impact and you eliminate breakage. It's as simple as that.

In 1953, Thomas introduced the "Chip-Proof" insulator, designed to eliminate breakage caused by rough handling and assembling in the field. Today, utility service records have proved its worth in stopping breakage during assembly or disassembly of insulator strings. Here's why:

Thomas "Chip-Proof" design uses a "diverter skirt" — a heavy corrugation that can't break, designed with a contour that actually diverts the lower insulator or fitting away from the petticoats. No matter how roughly the insulators are handled, when the cap is pulled off the ball pin, it will first strike the diverter. This glancing blow deflects impact away from the lighter petticoats. Result: no chipping, no breaking . . . and a more rugged insulator.

Thomas "Chip-Proof" suspension insulators conform to the latest EEI-NEMA Standards (Classes 52-3 and 52-4) and are interchangeable with other units.

Throughout the country, wherever "Chip-Proof" insulators are now in use, their performance record speaks for itself. See your nearest representative today and ask for a demonstration.

Specify Thomas Insulators — The Best by Line Test.

**Patent applied for*

The R. Thomas and Sons Co.

LISBON, OHIO

1873 THOMAS INSULATORS our 83rd year RELIABILITY 1956

POWERS *American* PRESENTS . . .

an aerial unit designed specifically for operations requiring only one workman

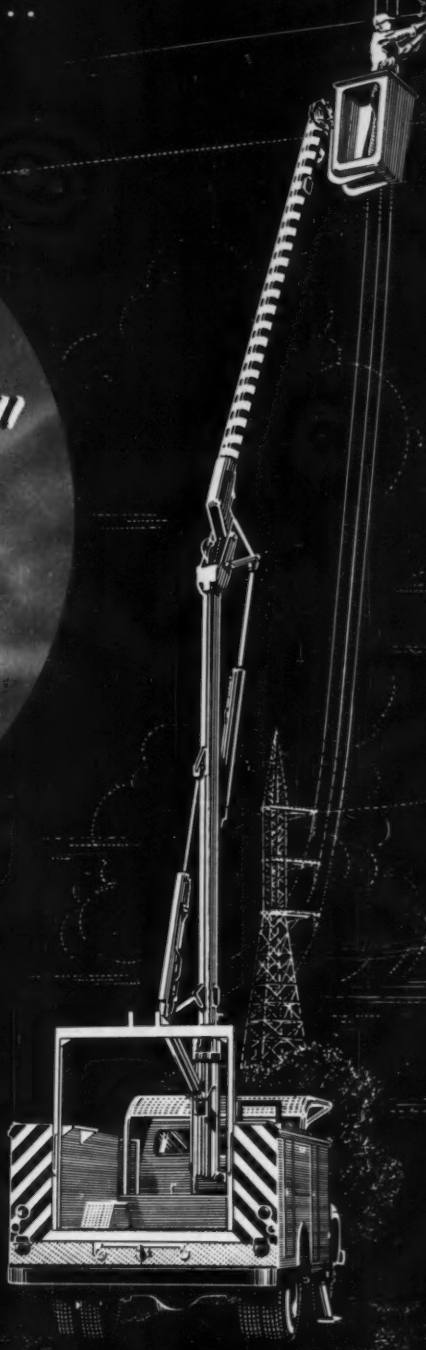
THE
COMPLETELY NEW

Series AB-1-41

"Sky-Master"®

HYDRAULIC AERIAL BEAM

FOR WORKING IN
HARD-TO-REACH PLACES
WITH GROUND-LEVEL EASE

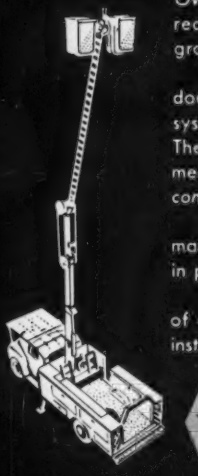


Over • under • around obstacles . . . Sky-Master quickly reaches out-of-the-way work — and provides on-the-ground safety and comfort for the workman.

Independently-operated steel beams are moved by double-acting hydraulic cylinders, through a unique system of linkage which greatly increases operating range. There are no chains, sprockets, or other secondary means of actuation. Supporting mast can be rotated *continuously* in either direction.

Work basket and insulated outer beam protects workman from 60,000 volts. Basket is automatically locked in position in event of damage to hydraulic lines.

The AB-1-41 . . . having ground-to-basket floor height of 41' . . . can be equipped for your particular job, and installed on a Powers-American Body that fits your needs.



The heavy-duty Series AB-37 and AB-43 Sky-Master carries two men up, out, over, or down. Available in 37' and 43' ground-to-basket heights.

Descriptive literature on Series AB-1 and Series AB Sky-Master — with price information — will be sent on request.

McCABE-POWERS AUTO BODY COMPANY

5900 NO. BROADWAY • ST. LOUIS 15, MO. • 625 CEDAR ST. • BERKELEY 10, CALIF.

Only 13 when he succeeded his father as head of many Mongol clans, Genghis Khan grew to be the 13th century's mightiest conqueror, his empire extending from the China Sea almost to the Baltic. The success of Genghis Khan's mounted troops rested on their exceptional discipline, speed, ruggedness . . . and the remarkable flexibility and practicality of their armor . . .

PROTECTED... against constant enemies

Flexibility and *practicality*, important characteristics of armor in Genghis Khan's day, can refer as readily to a modern-day kind of protection—Kerite Cable's never-equalled, never-surpassed insulation. Moreover, Kerite's endurance and resistance to constant attack truly would be a credit to one of those intrepid 13th century Mongol guardsmen.

Kerite Cable has to stand the test of not one enemy, but many—not for days or months, but for 30, 40, 50 and more years. Water, heat, cold, sun, deteriorating elements, time itself—these and more find Kerite an invincible opponent.

Wherever it is used, the world over, Kerite performs perfectly, lasts almost indefinitely. That is the reason wise buyers specify it.

The value and service life of a product can be no greater than the integrity and craftsmanship of its maker.

KERITE CABLE

THE KERITE COMPANY—30 Church St., New York 7, N. Y.
Offices also at 122 S. Michigan Ave., Chicago; 582 Market St., San Francisco;
3901 San Fernando Rd., Glendale 4, Calif.; 31 St. James Ave., Boston

Founded 1854

EDITORIALS

Needed: A Steering Committee for Live Better . . . Electrically

Next month the Live Better . . . Electrically program will be a year old. In this time the electrical industry has not only accepted the program and embraced it warmly but contributed many ideas. Today cooperating companies are working smoothly under the leadership provided by the originators of the plan. Effective use is being made of the materials provided. The Live Better . . . Electrically kinescope and movie have been widely shown and well received. Program booklets are to be found across the country in utility offices and in the homes of customers. Right now the stage is being set for a big fall retail appliance drive (See page 156).

In short, Live Better . . . Electrically at the end of its first year is well and successfully launched. Certainly the founders of the program may well be proud of the initiative and statesmanship they have shown in pioneering it. But if it is to be the lasting program with the breadth and reach for which it was conceived—and of which it is capable—consideration should now be given to the organization of a steering committee of participants. In this way the whole industry can play a bigger role in the program it has thus far advanced so well.

The time is ripe for the Edison Electric Institute —possibly acting through the Industry Coordinating Group to take the lead in bringing this broad support to the Live Better . . . Electrically program.

An appropriately manned committee could materially broaden participation in Live Better . . . Electrically. Such a steering committee would include all industry groups: utilities, electrical manufacturers, distributors, dealers, and contractors.

Under such diversified guidance and participation the Live Better . . . Electrically program could reach ever greater heights of success and broaden its activities in the field of residential sales promotion and "Housepower".

Construction Today: A Revolution in Methods

Construction departments of electric utilities today are running into a kind of double squeeze play. The cost of construction is rising steadily—up 25% in the last 5 years—and shortages of experienced men are cropping up in the construction crafts.

The effect of this situation promises to worsen as the industry advances to meet the load conditions forecast ten years hence. On the basis of double the load in ten years, utilities will be adding each year up to twice as much generation, transmission, substation and distribution capacity as they are today.

The job will have to be done with a labor force not much larger than today's. Moreover, this labor force will be paid and will use materials of construction that will cost proportionately more.

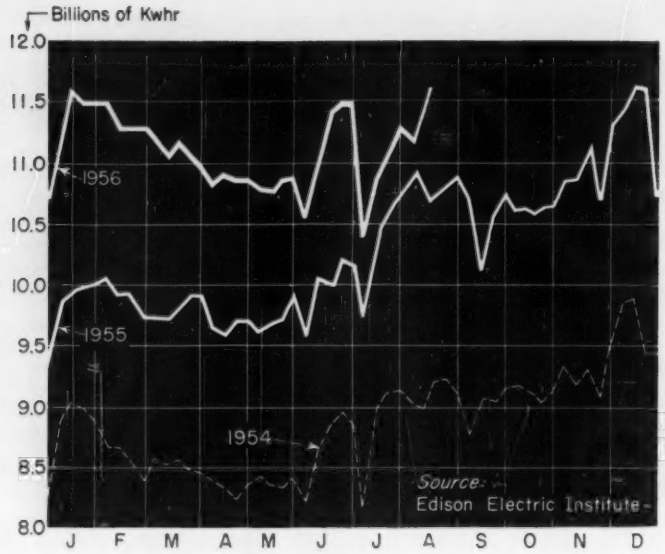
Superficially this appears to be an alarming situation. Certainly it is not to be taken lightly. However, it is the kind of challenge upon which the reputation of American scientific and engineering skill has been built.

The very economic situation that created these threatening conditions bears the seeds of their solution. Already today, under the spur of economic need, there is a growing revolution in materials of construction. And with it, hand in hand, a new functional simplicity of structual design is giving the widest possible play to mechanized fabrication and erection techniques.

Many of these are to be seen within the pages of the special report on construction that is a feature of this issue.

Taken together with the pioneering in generation, transmission, and distribution that is the hallmark of our engineering era, this revolution in construction materials, methods, and machines is encouraging. It promises utility systems for tomorrow that will meet their envisioned loads with ample margins of cost and capacity well within the economic limits imposed by any secular swing pinch in the cost of materials and manpower.

ELECTRICAL WEEK



OUTPUT

Week ended Aug. 14
11,530,000,000 Kwhr
Up 7.5%

Atomic Energy Commission requirements—1,125,000,000 kwhr (Electrical World estimate). Excluding AEC, output increase was 6.1%

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Aug. 11	+7.5	+7.4	+3.3	+7.6	+12.5	+5.9	+15.1	+15.8	+6.1	+4.2
Aug. 4	+2.4	+3.3	−4.8	−3.1	−1.2	+5.7	+14.4	+14.1	+11.5	+3.5
July 28	+5.3	+6.6	−0.3	+1.5	−2.8	+7.4	+13.0	+22.0	+11.3	+8.3

Seasonally Adjusted Index 217.7 Week Ago 211.0 Year Ago 203.0

Here are the issue's highlights . . . Power Reactor Development Corp starts work on its big breeder reactor near Monroe, Mich., as Atomic Energy Commission outlines "areas of uncertainty" . . . President Eisenhower kills Southwestern Power Administration rate-freeze bill amid protest of co-op . . . Senate subcommittee reports on Dixon-Yates contract . . . Pennsylvania P&L is told to cut rates $1.4 million in an order that reflects state PUC's thinking in several recent rate cases . . . Coal pipeline to CEI is now filled with water . . . The South establishes its long-range atomic energy goals . . .

Westinghouse's long-struck turbine plant at Lester, Pa., will shift to high gear by mid-September . . . Democrats hop on Ike's power policies with a "give-'em-hell" touch . . . Middle South Utilities holds regional meetings to meet more stockholders . . . Studies are urgently needed as high summer peak loads change equipment performance . . . 265/460-v underground costs less than 4 kv in urban areas . . . Load survey data is recorded on tape.

Industrial users meet to protest plans of Niagara Mohawk Power to seek a rate increase on 25-cycle power. Company says destruction of Schoellkopf Plant necessitates higher rates . . . 7½% increase in municipal electric rates is sought by Springfield, Ill., Commissioner George M. Oliver.

Ohio Edison and six CIO locals reach a settlement in contract negotiations. Union negotiating committee accepts package offer totaling 14.95¢ an hour increase, including 12.56¢ for wages. Agreement includes two-year pact.

Worcester County Electric investigates municipal lighting department of Holden, Mass., at request of town manager. The survey will forecast whether it would be expedient to consider acquisition of the lighting department by the Worcester utility. Town authorities will study the report Aug. 27.

NEWS OF THE INDUSTRY BRIEFLY TOLD

Washington Wire . . . Federal Power Commission decides that Alabama Power must pay $156,449 to U. S. for headwater benefits received directly from a federal project upstream from the utility's Coosa River projects. FPC also bills Alabama Power $4,800 for cost of making the decision . . . Robert H. Ingram resigns as assistant chief of REA's Information Services Division. He will work with the government's international trade fairs program . . .

Atomic Energy Commissioner Dr Willard F. Libby urges industry to develop techniques for burning plutonium in nuclear reactors. Breeder reactors produce the deadly poisonous but commercially useless plutonium in large quantities. The British can produce relatively inexpensive nuclear power by selling by-product plutonium for use in nuclear weapons, Libby says . . .

Central Alaska Power Association asks FPC for a preliminary permit to study a hydro project at Woods Canyon on Copper River. At same time, Harvey Aluminum asks FPC to withdraw permit Harvey received in 1954 for same purpose. The Alaska association, a combine of public power groups, has agreed to sell Harvey Aluminum 240,000 kw of prime power from the huge project.

Plans are being laid to combat forthcoming natural gas heating in Pacific Northwest. A group of electric heating manufacturers and local electric industry groups are considering an intense promotional campaign.

Interstate Power completes negotiations for acquisition by merger of Northwestern Illinois G&E. Power plants and lines will be integrated into one system.

Governor Herter okays legislation authorizing a Massachusetts Commission on Atomic Energy to consist of a chairman-coordinator on per diem pay basis and six non-salaried members. Group will meet at least four times a year.

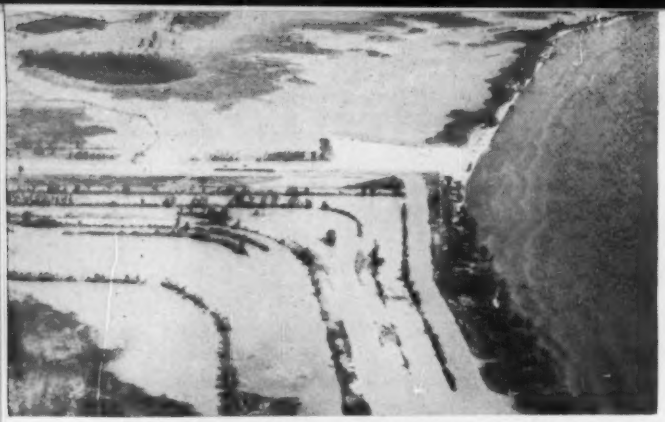
A 4% interest rate, highest for a public utility Aaa issue in over 20 years, is set on $40-million Consumers Power first mortgage bonds. Halsey Stuart & Co group won the issue with a bid of 100.21% and is offering the 30-year bonds at 101% to yield 3.94%.

ABOUT PEOPLE IN THE INDUSTRY

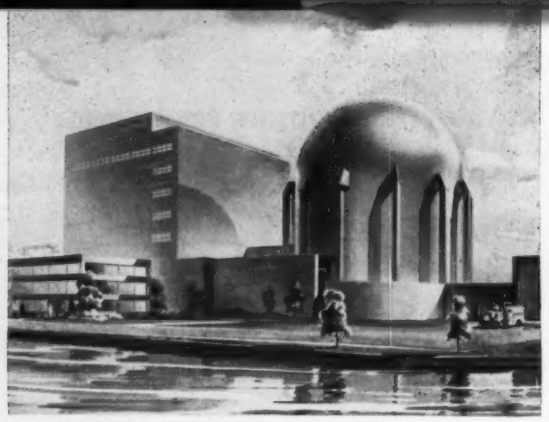
Pacific Northwest Power's proposed $217.4-million Mountain Sheep-Pleasant Valley project would be financed through purchase of 15% equity securities by the four utilities that organized PNP and balance in bonds sold to institutional investors and public. The plan is "excellent both as to feasibility and practicality," declares **Kinsey M. Robinson,** president of PNP and Washington Water Power, in fourth week of FPC licensing hearings.

The electric utility industry needs "better communications within our own organization and with our customers," **W. J. Clapp,** president of Florida Power, tells 55 students of SEE-Georgia Tech Utility Executive Course. Clapp observes: "The electric utility industry has done more to improve the standard of living of mankind than any other industry . . . Our problem is to get this story across to our consumers and the public."

More News About People page 198



THE SITE OF PRDC's reactor will be in the 10-acre white patch (above) in this 900-acre stretch of isolated marshland



THE 150-MW FAST BREEDER will be about 3,500 ft from nearest people. The plant should be ready by 1959 or '60

PRDC Starts Work on Big Breeder

With Confidence . . .

Construction of the world's first large breeder reactor has begun. To be on Lagoona Beach, Mich.—7 mi north of Monroe—the plant will cost about $54.5 million by completion.

Power Reactor Development Corp, a group of 26 industrial firms over half of which are utilities, is building the reactor with conditional permission of Atomic Energy Commission. Walker L. Cisler, president of PRDC and of Detroit Edison Co, predicts that the plant will meet all possible requirements of AEC.

Cisler also said he was "almost surely certain" that the AEC will authorize supply of four tons of fissionable uranium for operation and will grant authority for operation of the plant (which should start at low level about December 1959 and build up to full 150-Mw rating in the following year).

Atomic Power Development Associates, Inc, already has established theoretical safety characteristics and is checking them out experimentally. APDA's Director Alfred Amorosi says the new plant will be "safer than a coal-fired plant."

Dr. Hans Bader was brought in as a double-check on the experts, reported Arthur Griswold, who assists Cisler. His finding, and that of the AEC, is that safety is no more of a hazard than on other projects constructed, Griswold said.

But Amid Apprehension . . .

Atomic Energy Commissioner Thomas E. Murray refused to approve the conditional construction permit issued by the AEC. He was alarmed by the AEC's advisory committee's observation that not enough is yet known to guarantee that the reactor is not a public hazard. Murray's vigorous dissention attracted publicity. Many persons are apprehensive—among them is Michigan's Gov G. Mennen Williams.

After studying PRDC's application, the AEC found:

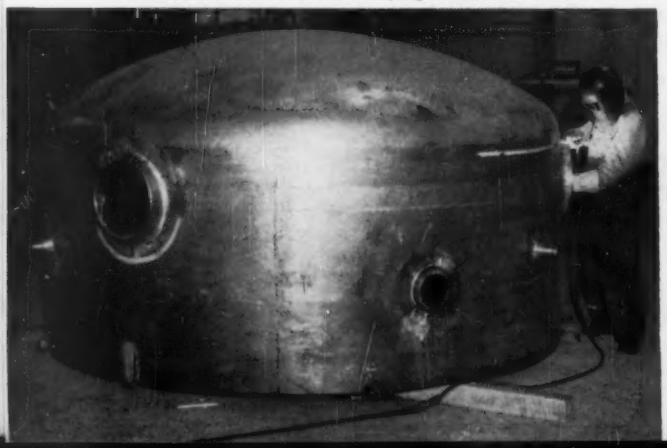
- PRDC, Atomic Power Development Associates, Commonwealth Associates, Inc, and United Engineers and Constructors, Inc, technically qualified to design and construct the reactor.
- "Areas of uncertainty" that must be found, investigated, and resolved. Among these are:

1. Whether there will exist in PRDC's reactor a "positive component of the temperature coefficient" similar to the Commission's experimental breeder. It is thought that "dimensional distortion of the core structure" causes this. In the PRDC reactor, this condition must be found and its effect, if any, eliminated.

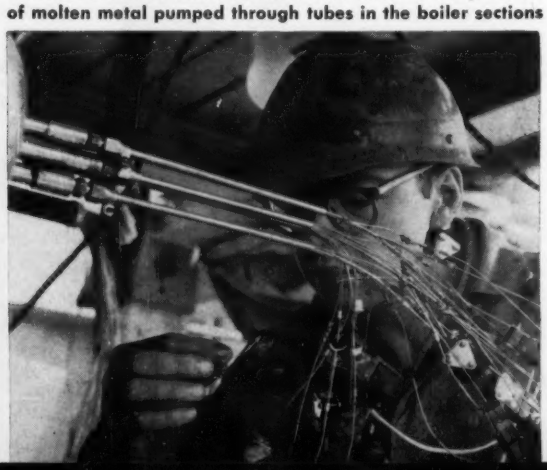
2. Whether there is a "credible condition" of meltdown and reassembly of the fuel of the PRDC reactor which could explode, rupturing the safety dome.

But the Commission believes that the safety problems can be resolved satisfactorily in due course.

THIS IS UNDER-HALF of 1½-in. steel reactor vessel. The nozzles will admit tubes carrying molten sodium to reactor



SUPERSENSITIVE THERMOCOUPLES will monitor temperature of molten metal pumped through tubes in the boiler sections



Ike Kills Rate-Freeze Bill

A bill aimed at freezing Southwest Power Administration rates, backed by public power supporters, has been vetoed by President Eisenhower. The measure, which would have included all federal power rates, originated from charges that a 2.2-mill increase, sought by Interior Department because SPA was operating at a deficit, would place an unfair burden on co-ops and public agencies.

Eisenhower said the bill would have prevented the Interior Secretary from fulfilling obligations of the Flood Control Act of 1944 to establish rate schedules that will amortize the investment in federal multiple-purpose projects allocated to power. He also said preference customers would not have to absorb the deficit of a 30-year contract with an aluminum company made in 1952 "at unrealistically low unit rates."

Joe Jenness, acting general manager of the National Rural Electric Cooperative Association, said the President's veto showed "no sympathy or understanding of the plight of farmers in the Southwest."

More Action on Niagara

New York State Power Authority is filing a formal application Aug. 20 with the Federal Power Commission for a license empowering it to develop the U. S. side of the Niagara River. Observers feel the Commission must refuse the license on grounds that it lacks jurisdiction because of a Senate reservation in the 1950 treaty. The reservation authorizes Congress to decide whether Niagara will be developed by public or private interests. The FPC's refusal is expected to lead to a court test of the reservation.

Dixon-Yates Contract Blasted

The Senate subcommittee on antitrust and monopoly of the Judiciary Committee has issued its staff report on the Dixon-Yates contract. It charged:

- The independent character of Atomic Energy Commission and Tennessee Valley Authority "was brought into serious question."
- Officials of Department of Justice and Securities and Exchange Commission were persuaded to take legal positions counter to precedent.
- Administration of law by SEC was brought into disrepute because of SEC's "flagrant departures from accepted interpretations of the Public Utility Holding Co Act and its succumbing to pressures from 'higher authority' emanating from the White House."
- AEC was forced to sponsor a contract which the Department of Justice has since asserted violated the Holding Co Act, the Atomic Energy Act, and the conflict of interest statutes.

The document charges that the purpose of the Dixon-Yates contract was "to take Memphis out of TVA territory." It finds that cancellation of the contract has not "changed this result. Memphis has been forced to build its own plant and this leaves the TVA system impaired by the loss of its Memphis territory."

TVA Is "Doomed" If . . .

Both of Tennessee's Democratic senators have warned that the next vacancy on Tennessee Valley Authority's board will be filled by a foe if President Eisenhower is re-elected. Sen Estes Kefauver said that "TVA will be destroyed," and Sen Albert Gore said "it would be awful tough going with an anti-TVA board."

The board currently is headed by Eisenhower-appointed Gen Herbert D. Vogel. Dr. Harry A. Curtis' term as a board member expires May 18, 1957. Curtis, now 72, was appointed by President Truman and has stood with Dr Raymond Paty for the principles of TVA "in his modest, unspectacular, and quiet way," declared Leonard Beard, president of Citizens for TVA. Rep J. Percy Priest, meanwhile, has urged citizens of the valley to press for the re-naming of Dr Curtis.

PUD Plan Faces Court Test

Proposed formation of a joint operating agency—the Washington Public Power Supply System—by 17 PUD's in the state now faces a court test. A taxpayer has filed suit in Clallam County Superior Court to test the constitutionality of new laws that enable PUD's to form operating agencies.

Under the PUD plan, the agency would build and operate a 200,000-kw steam plant and several small hydro plants to: (1) enable smaller PUD's to participate in securing power supplies, (2) make construction of smaller hydro projects economically feasible, and (3) use now-wasted "dump" Columbia River power by buying excess power from Bonneville Power Administration to supplement the proposed plants.

The PUD's tried several years ago to form an operating agency and to finance construction of Priest Rapids Dam, but failed to win approval of the state power commission. Since then, the law has been changed so that approval is required of the state director of conservation and development, instead of the commission.

A Red-Hot Baton

Sixteen-year-old Drum Major Irving Gilman, leading Hamlin, N. Y.'s, fire department carnival parade, flipped his baton high in the air—as usual without looking—and stretched out his hand to catch it.

No baton.

It was welded to a 5-kv line overhead. A Niagara Mohawk Power Corp crew restored service 75 min later.

PP&L Told to Cut Rates $1.4 Million

In its order of July 16, the Pennsylvania Public Utility Commission:

- Ordered Pennsylvania Power & Light Co to reduce its rates by $1,366,156.
- Found fair value of property at $385 million, or 20% above its net original cost.
- Set a fair return at 5.7% on fair value of the property.
- Dis-allowed the company's proposal of amortizing deficiency of depreciation reserve requirement.
- Disallowed proposal to normalize tax depreciation variance.

In essence, this PUC order contains much of the commission's thinking in recent rate cases, and may be indicative of what may happen in similar future cases.

The background of this particular order goes back to Dec. 30, 1954, when the company proposed to make certain changes and amendments in its basic rates charged to 2,878 customers, principally in the industrial power group. Although some of the customers would have received nominal increases and others small decreases, the over-all result of this rate adjustment would have meant a decrease in actual operating revenues of $322,921, or .85% of the affected revenues.

The commission, on its own motion, decided to conduct a full-scale rate investigation to determine whether the rates were fair and reasonable for all customers. The reduction of $1,366,156 consequently applied not only to large industrial customers but also to residential and commercial customers.

This action by the commission closely parallels the rate order issued to Metropolitan Edison Co.

A number of features of the PP&L order are worthy of comment:

1. Trended original cost. The 23 complainants who were affected by these rate changes contended that the company only submitted trended original cost instead of replacement cost of the property and that "it should be borne in mind that although they (the depreciation and trending studies shown in PP&L's exhibits 115 and 143) appear to be factual, an analysis will show that they are founded upon the exercise of judgment and decision in a multiplicity of details and procedures. Being so based, they are in the final result but dressed-up opinion."

The commission overruled this contention saying that, under the law which requires a determination of fair value, they must give consideration, among other things, to original cost and reproduction cost, and that in view of the great expense in making reproduction cost studies, trending is the only practical and economical method of arriving at reproduction cost estimates.

The complainants also tried to in-

(*Continued on page* 210)

Westinghouse, Union End Long Lester Strike

Full-scale production is expected by mid-September at Westinghouse Electric Corp's Steam Division plant in Lester, Pa., where a 298-day strike finally ended. Some 6,000 members of Local 107, United Electrical Workers, independent, returned to work earlier this month after ratifying a five-year agreement.

Settlement of two key issues—an "unworkable" incentive system and deciding what to do with fired workers—ended the costly walkout Aug. 7. The contract substitutes a "day work" pay plan for the incentive system. A 75-day disciplinary furlough for the dismissed employees resolved the second issue.

After agreeing to the local supplement to the contract, union members okayed the national Westinghouse-UE contract that ended strikes last March at eight other Westinghouse plants. Besides local level wage adjustment, Lester workers get an increase granted in October 1955, and one scheduled for this October. Other increases of 3% will follow in 1957 and 3½% in 1958 and 1959.

"The provisions of the contract to help improve operations assures that the Lester plant will not lag behind its competitors in operating efficiency, thus increasing job security for all of our employees," said W. C. Rowland, vice president and general manager of the Steam Division. "We are confident that this agreement will help bring years of labor peace and harmony to the Lester plant," he added.

Other major provisions include:

1. Establishment of "time measurements" of jobs to be used by management in controlling labor and other costs and in scheduling jobs.

2. Arbitration of all disciplinary penalties if no agreement is reached after exhausting the regular grievance procedure. This provision is aimed at eliminating work stoppages.

3. Adoption of a new keysheet to eliminate out-of-line rates and to maintain wages well above the area average for comparable jobs.

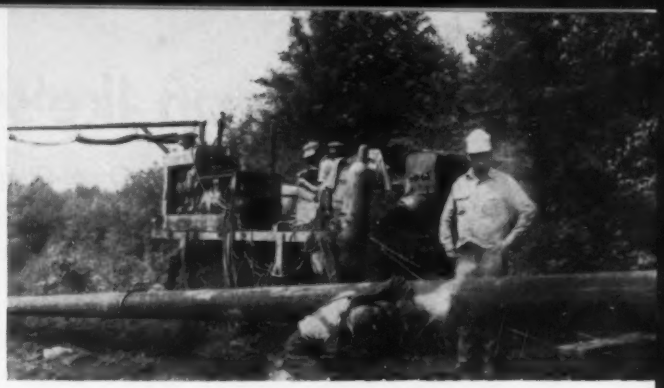
4. Review of job reclassifications made to eliminate former inequities, with arbitration after a 75-day period if agreement is not reached.

5. An improved seniority system providing long service employees more job opportunities in accord with their skills.

According to the union, the company lost about $75 million in production during the 10-month dispute. Westinghouse officials termed this estimate as "too high," however. Union members were out about $21 million in lost wages.

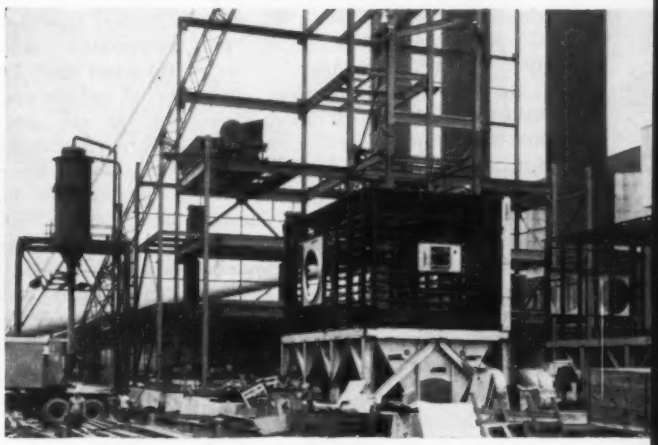
One question that remains is deciding whether unemployment compensation can be claimed by workmen. The State Department of Labor and Industry ruled late last year that the dispute was a lockout because Westinghouse rejected Gov. George M. Leader's settlement proposal. The company and others brought suit to prevent payments. The suit is now pending before Pennsylvania's Supreme Court.

Leaving mine, coal pipe is buried . . .



in 4-ft-ditch after critical welding . . .

and careful wrapping. Coal slurry . . .



to be processed in new CEI dryer

Pipeline's Status: Filled with Water

The coal pipeline linking Cleveland Electric Illuminating Co's Eastlake steam station with Pittsburgh Consolidation Coal Co's mine 108 miles away has come another step toward completion. As EW went to press, arrangements were being made to fill the line with water by Aug. 20, although pressure-test pumping was not slated to being immediately (EW, Aug. 6, p 67).

First of its kind in the world, the 10¾-in. Pitt-Consol line will carry crushed coal as 50-50 water slurry from mine to power plant. Along the way, the slurry will pass two pumping stations and a spare—all spaced roughly 30 miles apart. The spare will be used when a regular pumping station drops below 80% top operating efficiency. Pumps are high-pressure, adjustable-speed, piston-type machines driven by electric motors through fluid clutches. They will create a 1,000 psi pipeline pressure. The pumping stations are still being built.

Crushed coal will empty into CEI's new dryer, now under construction, where the slurry will be thickened to 60% weight solids in two 90-ft thickeners. The slurry then will be pumped to vacuum disc type filters and moisture content will be reduced to about 20%. This filter cake will be charged into a standard flash dryer and the dried product will be weighed and discharged into a storage bin. A belt will then convey it to the power plant's fuel bunker.

Waste Water to Be Clean

CEI is spending $2.5 million to guarantee that waste water from the pipeline will be purer than the water of Lake Erie into which it will drain. Final cleanup of the water will be handled by an 85-ft flocculator.

Because of the heavy erosive-corrosive nature of the fuel, heavy pipe wall sections and high tensile steel have been used. Crews laid and welded the pipe averaging better than 2.5 miles a day, despite unusually wet weather. Two welders applied the stringer bead. This probably was the most critical pass in the welding operation because 100% penetration had to be achieved, and the weld had to be absolutely free of slag deposits.

The line was laid in a ditch averaging between 4 and 5 ft deep to protect it from winter freeze-ups. As further insurance, controls have been provided so that a preceding pumping station will automatically pump through any booster station if a power failure occurs. Furthermore, coal will be stored at each booster station for emergency feeding into the pipe should something stop the coal feed at the source.

Dems Hop on Ike's Power Policies

Using a "give-'em-hell" touch, Oscar Chapman shapes a power and natural resources policy for the campaign that hits Republican rule, contrasting last four years with Democrats' 20-year "golden age of conservation"

Power and natural resources policy provided the Democrats with one of the most sharply drawn issues to emerge at their Chicago convention. It was an issue on which all shapes and stripes of Democrats had little trouble in getting together on what they would do, if they recapture the White House in November.

The fact that the platform plank reads like a page out of former President Truman's Fair Deal is no coincidence. Chief architect of the natural resources plank was Oscar Chapman, Secretary of the Interior under Truman and a long-time exponent of the New Deal-Fair Deal philosophy of resource development.

Chapman served as chairman of the advisory committee that drafted the natural resources plank, and he turned it into a polemic against the Eisenhower Administration, while terming the 20-year Democratic rule the "golden age of conservation."

Chapman hailed the natural resources record of the Democrat 84th Congress as built on the "tremendous conservation achievements of the Roosevelt and Truman Administrations" and asserted that it undertook one of the greatest programs of natural resource development ever assumed by a Congress.

Against this he posed what he labeled as the "faithless performance" of the Eisenhower Administration which he charged was symbolized by "Dixon-Yates, Al Sarena, Hell's Canyon, Tidelands Oil, atomic energy, and tax subsidies to private power companies."

These names will become catchwords as the campaign heats up. Chapman expects them to figure prominently in campaigns in Oregon, Washington, Idaho, Montana, and other western states, the TVA area, and areas served by Southeast and Southwest Power Administrations.

Power policy—public vs private—also is expected to figure in the New York State campaign as result of the defeat of the Niagara power development bill calling for development by the New York State Power Authority.

The Administration's partnership development program took the brunt of the Democratic attack. It was characterized as a "giveaway" in which dwindling resource wealth was dissipated by "political manipulation and administrative subversion."

Specifically, the platform calls for an about-face in handling of the Tennessee Valley Authority program with a step-up in production of hydroelectric and steam generation. In an interview with Electrical World, Chapman said this would call for con-

South Sets Up Its Atomic Energy Goals

Establishment of state supported nuclear research centers and the development of the atom's potential by "existing power systems" recommended at 16-state meet

Recommendation that the South establish "a long range regional program" for "one or more strategically located nuclear test facilities" highlighted the recent Southern Regional Education Board Work Conference on Nuclear Energy in St. Petersburg.

The meeting, attended by 200 representatives from 16 southern states, climaxed a year of regional planning by SREB, which was charged by the Southern Governors' Conference last year with providing recommendations for the governors to act on at their annual meeting in White Sulphur Springs next month.

These test facilities were virtually called for in an opening address by Florida's Gov. LeRoy Collins, who first advanced the idea at the 1955 Southern Governors' Conference that the South should move rapidly to capitalize on the atom's industrial potentialities.

The conference also recommended that a 16-man board of directors, one from each state, be established to aid in setting up such centers.

SREB felt that, other than the research centers, the existing utility systems in the South would be able to satisfactorily develop the industrial potential of the atom.

They recommended "that the states within the region continue to rely on the existing power systems and manufacturers for the orderly economic development of commercial nuclear power in the South in order to bring the benefits of lower power costs, at the earliest possible time, to the consumers within the region."

On the surface, this might appear as a recommendation that the federal government keep its hands off such projects. Still, when questioned, one work conference leader replied, "TVA is an existing power system, too."

SREB gave these reasons for the recommendation:

- Low cost of fossil fuels in most of the South makes "economic demands for nuclear power . . . less than in other regions." The region's supply of fossil fuels was predicted to be "adequate . . . at least during the next few decades."
- Both private and publicly owned utilities in the region are "directing efforts toward hastening the date when atomic energy will be competitive . . ." The industry, said SREB, "is prepared to meet the needs of the present situation and . . . will be prepared to build atomic power plants as soon as there is a reasonable prospect of advantage to the consuming public."

struction of the controversial Fulton steam plant—or one similar to it. Chapman termed the Administration policy in cutting back TVA appropriations and pushing a bond-selling program to make TVA pay its way a "gigantic conspiracy to destroy TVA."

The plank also calls for:

• Integrated regional transmission systems.

• Rigorously enforced public body preference clauses.

• Strengthening of the public power competitive yardstick in power developments under TVA, REA, Bureau of Reclamation, Bonneville Power Administration, and Southeast and Southwest Power Administrations through the widest possible use of electric energy at lowest possible cost.

The Democrats took another lick at the Dixon-Yates contract by pledging to block the "reemergence of the private electric utility super-combination which has taken place under the Eisenhower Administration" . . . seeking to "avoid proper federal regulation, to obtain vast subsidies from the taxpayers, and to seize monopoly control of our underdeveloped hydro and atomic energy potential."

The platform claims Democrats launched the atomic era and established U. S. preeminence in the nuclear field, only to have the Republicans reverse the field and plunge the Atomic Energy Commission into partisan politics.

"The Republican Administration has followed the same pattern in the field of atomic energy" the platform charged, "that it has pursued in its treatment of other natural resources —lofty words, little action, but steady service to selfish interests."

Platform pledges the party to:

1. Restore non-partisan administration of atomic energy and to expand nuclear development vigorously.

2. Accelerate the domestic civilian atomic power program by construction of a variety of demonstration prototype reactors.

3. Give reality to the "atoms for peace" program.

4. Increase production of fissionable material for use in a stockpile for peacetime commitments at home and abroad, and/or a reserve for weapons.

5: Conduct a comprehensive survey of radiation hazards from bomb tests and reactor operations to determine additional measures required to protect existing and furture generations.

Your Atomic Patents

These new patents, owned by the government, are for license on a nonexclusive, royalty-free basis; copies may be obtained from U. S. Patent Office, Washington 25, D. C., for 25¢ each:

• Pressure Testing Device and Method—tells how to test canned uranium slugs for defects that might cause a "casualty shutdown accompanied by great danger and expense." No. 2,745,279.

• Condensable Vapor Extraction Apparatus—a device for obtaining a high vacuum in a large tank. No. 2,737,779.

• Liquid Monitoring Device—measures radioactivity in water, especially beta radiation. No. 2,738,426.

• Neutronic Reactor Measuring and Safety Rod Operating Apparatus—will shut down reactor. No. 2,731,592.

• Fluid-Cooled Neutronic Reactor —increasing circulating cooling water enables power capacity to be boosted accordingly. No. 2,741,593.

• Submerged Reactor—built 18 ft deep in a river or lake for cooling and shielding. No. 2,743,224.

• Reactor—heavy water-moderated; fuel is in slug or rod form; moderator is pressurized to prevent boiling, yielding a "relatively high density" and minimizing reactor's critical size. No. 2,743,225.

• Re-entrant Cooling Reactor—gets around difficulties of sealing "the many openings in the sides of reactors where thin-walled aluminum (coolant) tubes enter and exit." No. 2,744,064.

NEWS IN BRIEF

ATOMIC

Construction of a homogeneous reactor has been completed at Oak Ridge, Tenn., and is expected to become critical this fall. It is designed to **test experimentally the economic feasibility of using fuel dissolved** in a liquid moderator which circulates as a coolant . . . General Electric Co has plans for a research reactor on drawing boards now. If construction is okayed, it will go to AEC's Hanford laboratory **to test use of plutonium as a fuel.** . . . Next year, Hungary will start work on its first atomic plant. It will be the **first Soviet reactor to be built outside the U.S.S.R.** . . . South Scotland's Electricity Board has decided to build a **$89-million, two-reactor** (graphite-moderated, gas-cooled) power station to generate 250 to 300 Mw. First reactor to operate in 1961.

STEAM

Before TVA could energize its new 250,000-kw Gallatin, Tenn., unit, an "electrical disturbance" shook the machine, tripped emergency alarm relays, and shut down the unit. **An overheated coil** in the generator burned a saucer-size hole in a heavy metal coverplate. Manufacturer's representatives called trouble "routine start-up difficulties" and seek to learn precise cause.

Houston (Tex.) L&P has ordered a 240,000-kw machine. Slated for operation in 1959, it will be 45% larger than HL&P's current largest generators. . . . **Commonwealth Edison Co** has ordered a 305,000-kw machine for its Joliet station, scheduled for 1959. This is the third such unit ordered this year. . . . **Public Service Electric & Gas Co (N.J.)** is building a $100-million plant for 1957. It will produce 450 Mw with two 225-Mw machines . . . **Kentucky Utilities Co** will add a 120-Mw unit to its Green River generating plant near Central City, Ky., by mid-1959. Coal consumption will jump 600,000 tons the first year. . . . **Washington State Power Commission** has applied for use of Lake Cle Elum water for a steam plant development, but no guess was proffered on when developmental work might start . . . England's High Marnham power station is now being built; to have ultimate capacity of 1,000-Mw in 200-Mw machines; largest single station and units in the country.

San Diego G&E's second 106-Mw turbine-generator at Encina plant went on the line in early August. Excavation for a third unit of same size is to start this month; operation slated for 1958. . . . **Georgia Power Co's** steam plant near Brunswick will get a 75,000-kw unit to treble plant's capacity.

(*Continued on page* 208)

President Dixon holds informal regional meetings as . . .

Middle South Woos the Stockholder

MANAGEMENT
Stockholder Relations

Ten times as many shareowners turn out for meetings in three major cities as for company's annual session in New York

Middle South Utilities, Inc, has come up with a new way to woo the stockholder—regional meetings.

The company has the same problem that troubles many electric utilities: Thousands of stockholders scattered all over the country and only a handful of them present at the annual meeting.

So, Middle South tried an experiment this past year. The company held informal gatherings with stockholders in Philadelphia, Boston, and Chicago. All shareowners residing in the respective meeting areas were invited. Ten times as many shareowners went to these three meetings as to the company's annual meeting in New York City.

And the regional meetings were so successful that the company is now making plans to get acquainted with its shareowners in other major cities.

Middle South finds that these sessions provide an excellent opportunity for management to meet more of the company's owners. In their turn, the stockholders, many who never before attended a meeting, have a chance to get first hand answers to questions about the operations and the general economy of the area that Middle South serves.

Because Middle South has its headquarters in New York City, the company has held annual meetings in that city. Attendance, however, has been quite disappointing. Generally, the turnout for the annual session has consisted of about 50 stockholders plus as many bankers, analysts, and other corporate friends.

Stockholders' Response to Middle South's Invitation

	Philadelphia	Boston	Chicago	Total
Total Mailing	1822	4225	1506	7553
Total Replies	892	1854	771	3517
%	49.0	41.5	51.2	46.6
Total Accepting	153	389	111	653
%	8.4	9.2	7.4	8.6
Total Attending	113	300*	70	483
%	6.2	7.1	4.6	6.4

*estimate

However, in three regional meetings held this past year, the company made the personal acquaintance of about 500 of Middle South's 28,000 stockholders.

The methods that Middle South Utilities uses in inviting stockholders to these regional meetings have a great deal to do with the gratifying attendance.

Formal Invitations Impress

About three weeks before the meeting, the stockholder receives a hand-addressed envelope resembling a wedding invitation. Inside is a printed invitation to the regional meeting which is held at a large hotel. With the invitation is a stamped return envelope for mailing an enclosed reply card to the company.

If the shareowner indicates that he will attend, he receives a letter a few days before the meeting. Just a gentle reminder, the letter says that Middle South is happy that he will be there. It adds that he is welcome to bring a friend.

Informal Approach Pays Off

The methods that Middle South uses in conducting the regional meetings are also responsible for the enthusiastic stockholder response.

At the meeting, Edgar H. Dixon, president, introduces himself and the other company officials present. He speaks extemporaneously for about half an hour and then answers questions for nearly an hour. When the meeting is adjourned, light refreshments are served.

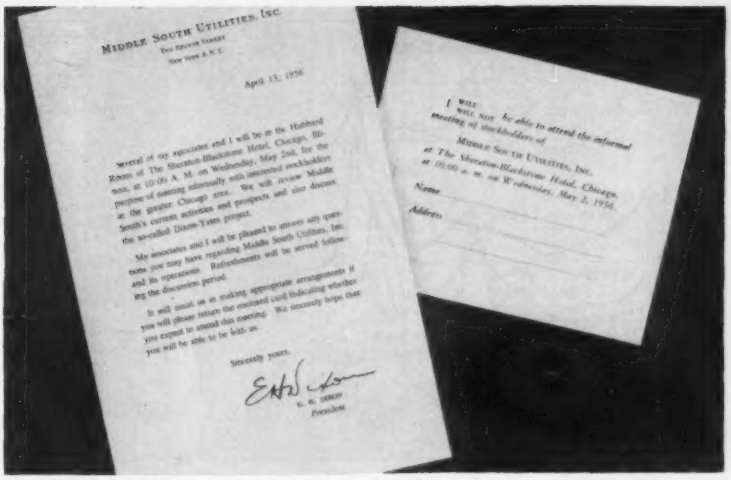
At all three meetings a very large number of stockholders went up to shake hands with Dixon. They thanked him for the meeting and asked still more questions of him and the other company officials.

Company Plans Two More

Some stockholders said that what they learned at the meeting dispelled any doubts they may have had as to whether investor-owned utilities are better for the country than public power.

Later, reports from trust companies and others in the investment field confirmed the success of the regional meetings.

Middle South Utilities is now making plans for two more regional stockholder meetings. They will be held in November at Los Angeles and San Francisco.


MIDDLE SOUTH UTILITIES, Inc.
April 13, 1956
Several of my associates and I will be in the Hubbard Room of The Sheraton-Blackstone Hotel, Chicago, Illinois, at 10:00 A. M. on Wednesday, May 2nd, for the purpose of meeting informally with interested stockholders in the greater Chicago area. We will review Middle South's current activities and prospects and also discuss the so-called Dixon-Yates project.
My associates and I will be pleased to answer any questions you may have regarding Middle South Utilities, Inc. and its operations. Refreshments will be served following the discussion period.
It will assist us in making appropriate arrangements if you will please return the enclosed card indicating whether you expect to attend this meeting. We sincerely hope that you will be able to be with us.
Sincerely yours,
E. H. DIXON
President
I will be able to attend the informal meeting of stockholders of
MIDDLE SOUTH UTILITIES, Inc.
at The Sheraton-Blackstone Hotel, Chicago,
at 10:00 a. m. on Wednesday, May 2, 1956.
Name
Address

Invitations are formal. But at the meetings . . .

President Dixon speaks extemporaneously; then . . .

He chats with stockholders and answers questions

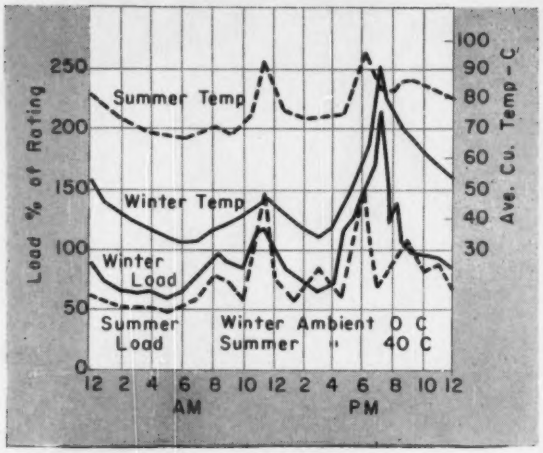


FIG 1—COMPARED are load and transformer winding temperature cycles for peak summer and winter days

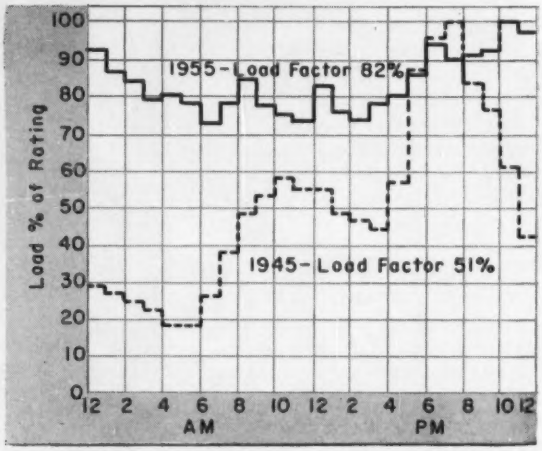


FIG 2—EFFECT OF AIR conditioning load on the daily load cycle is a major summer distribution system consideration

Summer Loading Analysis Urgently

DISTRIBUTION
Operation

Need for transformer design, loading practices study reflect high peak demands, temperature, daily load factor

A. M. LOCKIE, Design Engineer, Westinghouse Electric Corp., Pittsburgh, Pa.

Summer loading of distribution transformers, characterized by high peak demands, ambient temperatures, and daily load factor, threatens to force a revision of loading practice. Such revision would adversely affect operating economy. Recent design changes have raised load capability of some transformers to match today's conditions. But the desirability of a further increase, or of other changes in characteristics must be determined by a general economic analysis of loading.

A coperative study of summer loading should enable operating companies to anticipate handsome dividends in future development and application of distribution transformers. But it must be based on a better understanding of the relationship between loading and service life and of the economics of transformer characteristics. Within the past ten years, summer loads have changed markedly in two ways. The summer peak demand has grown until it exceeds the winter peak in many systems. Because the summer peak demand coincides with high ambient temperature, it may be the determinant of equipment rating on winter peak systems.

Load Factors Are Higher

A second, more subtle change in summer loads is the trend toward higher daily load factor. This is evident in Fig 1 and Fig 2. The latter compares a typical 1955 summer load cycle with one of a decade ago where air conditioning saturation is heavy. Higher load factor further reduces the ability to carry short-duration peaks. Higher load factor probably accounts for much of the difficulty, as most load-survey techniques are based on short-term measurements and correction factors derived from the earlier cycles.

Recent "heat storms" have brought a pronounced increase in the burnout rate of transformers without overload protection and a similar boost in circuit-breaker tripouts in protected units. Consequently some utilities modified their loading practices. But a reduced loading schedule is economically undesirable; it means a corresponding reduction in return on the capital invested in transformers. Yet it may have been the only practicable short-range procedure.

Insulation Improved

To increase transformer overload capability, Westinghouse Electric Corp has developed an insulation system of improved thermal endurance. Greater cooling efficiency diminishes the difference between average and hot-spot temperatures, and use of inhibited oil and better sealing of tanks virtually eliminate sludging and reduce oil deterioration. Field experience and functional life tests on complete transformers showed a substantial improvement in life expectancy. Accordingly, the calibration of breakers in self-protected transformers has been changed to provide more overload capability.

Other possible changes would boost transformer load capability higher. The ratio of copper temperature rise to oil temperature rise could be reduced, lowering the copper temperature for a given overload. New insulation systems of even greater thermal endurance could be used. But such means of increasing load capability boost the manufacturing costs also.

Moreover, heavier loading means greater losses and more voltage regulation. The cost of additional losses and the revenue lost because of decreased energy consumption at the lower service voltage tend to offset savings

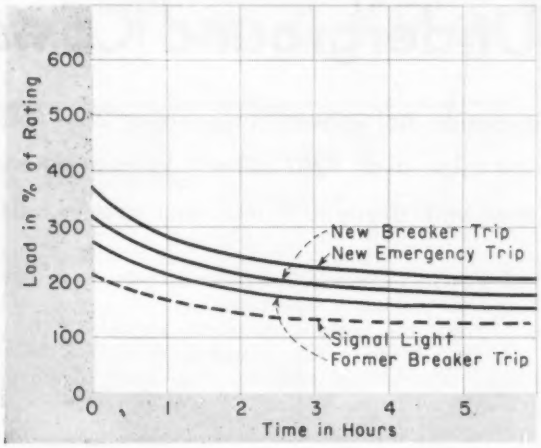


FIG 3—LOAD-TIME CURVES for CSP transformer following 75% load at 35C ambient shows rise in breaker trip settings

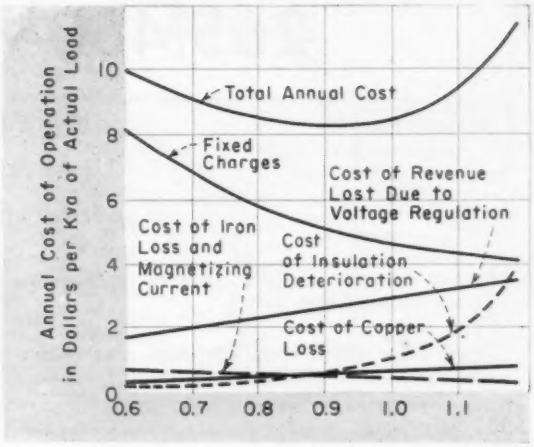


FIG 4—AVERAGE LOAD of a distribution transformer is shown for life of transformer in percent of rating

Needed As Operating Guide

from better utilization. Further construction or loading changes should hinge on economic justification. It would be folly for manufacturers to design for an overload capability without practical value; it would be unwise for operating companies to ignore adverse economic effects of overloading. During peak periods high operating costs are justified to avoid poor utilization during the rest of the year. But they should be scrutinized when annual loading is fairly uniform.

Determination of the most economical loading, involving many variables, is extremely complex. Even so, an approximate formula, indicating relative significance of major components of operating cost and their relation to transformer performance, can be a valuable guide to economic design and utilization. Factors in such a formula should be:

1. Fixed charges on capital investment.
2. Demand and energy charges for losses.
3. Cost of magnetizing current.
4. Revenue loss from voltage regulation.
5. Deterioration (analogous to depreciation, but showing the effect of loading on service-life expectancy).
6. Effect of load growth on all components of operating cost.

Cost Components Charted

Development of these relationships permits the construction of Fig 4, showing the relative magnitude of cost components and how they vary with load, averaged over the expected life of a transformer. The chart facilitates selection of the most economical loading schedule, and the desirability of further boosts in load capability or of other changes in transformer characteristics is indicated.

But an attempt to set up a suitable formula for the most economical loading, including all factors, reveals two serious gaps in available information: A realistic relationship between loading and life expectancy; and appropriate values for unit costs of revenue and energy losses.

The "American Standard Guide for Loading Oil-Immersed Distribution and Power Transformers" (ASA C57.32), once so valuable in stimulating economic utilization of transformers, is now of limited usefulness for these three reasons:

1. Aging data based on the effect of temperature on the tensile strength of cellulose in oil have only limited significance applied to transformers insulated with other materials.

2. The assumption that a given temperature exposure has the same effect on the life expectancy of all transformers makes no allowance for the manufacturer's skill.

3. The arbitrarily selected end point of life (approximately 80% of the initial tensile strength) has little logical correlation wth the ability of the transformer to continue in service.

Functional Testing Urged

Field experience and laboratory tests suggest this loading guide is unduly conservative for modern distribution transformers. Probably the best means of evaluating all factors affecting service life is "functional testing." This involves the operation of apparatus under accelerated aging conditions until failure occurs on a test chosen to indicate unfitness for further service. This method permits comparison of the relative service-life expectancy of various insulation systems and establishment of a realistic guide for loading electrical apparatus in which these various systems are used.

Ultimate proof of a loading guide is its correlation with field experience. Data relating actual loading and life are not easily obtainable, but several utilities are using sampling techniques to collect information. Such data is of maximum value when pooled and coordinated by the national association of operating companies. Similar cooperation could supply the lack of appropriate values for unit costs of revenue and energy losses that now is apparent.

265/460-v Underground Costs

DISTRIBUTION
Design

For high density residential underground service 265/460-v 13.8 kv has cost edge over 120/240-v 4-kv conventional underground even with dry-type transformer cost included

HOWARD S. SMITH Distribution Engineer, Colorado Central Power Co, Englewood, Colo.

When large urban areas with high load density are to be served underground, the modified 265/460-v, 3-phase, 4-wire system should be given strong consideration. This system for residential underground offers a cost advantage over the conventional 4-kv, 120/240-v underground system. This advantage holds true for the customer even with the installation of a full-capacity dry-type transformer. For urban areas where conventional overhead might hold a slight margin, these factors in favor of underground, and thus a 265/460-v system, should be considered:

1. Tree problems and trimming are almost eliminated.
2. Fewer transformers, in locations accessible to the street, ease the problem of replacement.
3. Three-phase power is immediately available.
4. The 100-amp service entrance equipment will be adequate in the average residence. Thus, current transformers should not be required on a 265/460-v system for any residence into the far future.

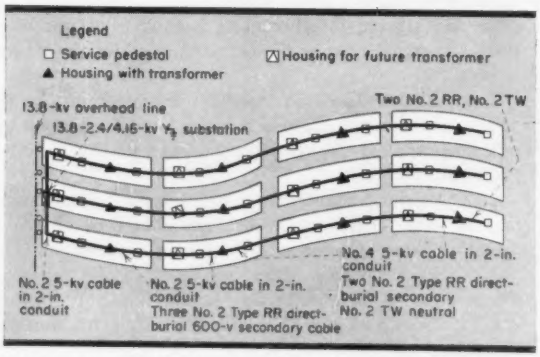

Legend
Service pedestal
Housing with transformer
Housing for future transformer
13.8-kv overhead line
13.8-2.4/4.16-kv Y substation
Two No. 2 RR, No. 2 TW
No. 2 5-kv cable in 2-in. conduit
No. 2 5-kv cable in 2-in. conduit
Three No. 2 Type RR direct-burial 600-v secondary cable
No. 4 5-kv cable in 2-in. conduit
Two No. 2 Type RR direct-burial secondary
No. 2 TW neutral

FIG 1—GARAGE LIKE ENCLOSURE is proposed to house 13.8-kv transformer which would feed 265/460-v system. For average demands exceeding 6.5 kva per customer, two more substations and 13.8-kv feeders would be needed

TABLE I — Cost Estimate for 265/460-v System with 75-ft Lot Frontage

12 Sectionalizing pedestals @ $250	$3,000
36 Service pedestals @ $160	5,760
1,540-ft, 3-in. Non-metalic conduit @ $51/100-ft	785
29,400-ft Three No. 2 RR cable @ $365/1000-ft installed	10,700
9,800-ft One No. 4 TW neutral @ $160/1000-ft installed	1,478
8,600-ft Trench and backfill @ $0.20/ft	1,720
Terminating labor and materials	600
300-kva Substation	6,640
Six poles and hardware	420
Total cost	$31,203

Higher Secondary Voltage is Coming

In exploring this highly controversial subject, the author recognizes that many changes will have to take place before the full economic advantage of the 265/460-v system can be realized. Two of these changes involve the availability to the customer of and sanction by electrical codes of 265-v or 460-v fixed major appliances. But the present feasibility of serving large apartment houses at 265/460-v may stimulate action.

The change from the present 120/240-v utilization level to a higher and three-phase level will be a slow process but should be viewed on a long-term basis. In all probability, however, a higher secondary voltage of necessity will be utilized as load per customer increases. Against these factors, this analysis is presented.

This article compares the costs of an underground 265/460-v wye, 3-phase secondary system without services installed; a conventional single-phase underground system operating at 2.4/4.16 kv wye primary without services; and a 13.8-kv single-phase overhead system with secondaries and services. A 12-block area has been chosen as a basis for calculations.

With average demands of 6.5 kva per customer and with a 75-ft lot frontage, the 265/460-v system will serve a 12-block area from a single substation where the block size is about 300 x 600 ft. To serve the initial substations, overhead 13.8-kv lines are proposed and would be present on every fourth block. Step-down substations should be housed in a garage-like enclosure along with the necessary secondary switchgear. Layout for such a system is shown in Fig 1. When the load exceeds 6.5 kva per customer, additional substations may be established by running an underground 13.8-kv feeder about 1,000 ft for each substation. This will allow load growth to approximately 13 kva per customer.

Serve Two-Block Area with 265/460-v Circuit

Each 265/460-v circuit will serve a two-block area. Circuits will be individually fused at the substation. To connect services to the underground system, service pedestals should be located in general so as to feed four services. Space should be allowed in the service pedestal for a sectionalizing switch or a capacitor. A typical design is illustrated in Fig 2. Lot line offsets usually found in subdivisions require that service conduits be extended to reach inside the boundaries of individual properties.

Less Than 4 Kv in Urban Areas

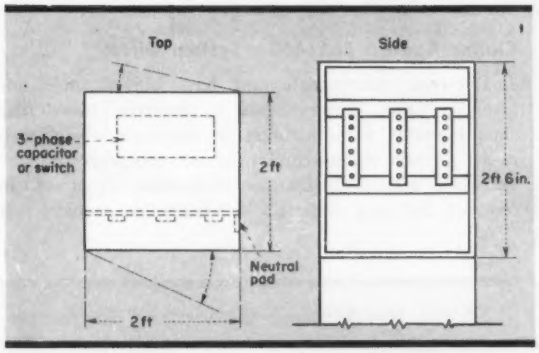


FIG 2—SERVICE PEDESTALS for 265/460-v system should be located so as to feed four customer services. Because of the trend toward lot-line offsets, it is desirable to stub conduit from pedestals into individual customer plots.

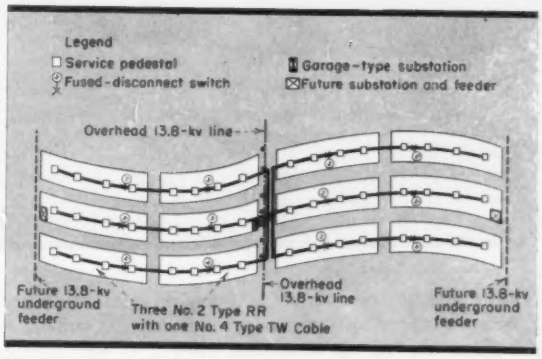


FIG 3—CONVENTIONAL UNDERGROUND provides 120/240 v single phase through 2.4/4.16-kv system fed by 13.8-kv overhead line. Future transformers would provide for load increase from 6.5 kva to 18 kva avg. demand per customer

The customer's service entrance will include a 10-kva dry-type transformer to step 460 v down to 120/240 v for all electrical devices except the larger air conditioning motors. However, a 3-phase, 4-wire secondary will be available to each customer to allow use of 3-phase air conditioning, heating, and other equipment. It is estimated the customer service will cost $400, including $240 for the dry-type transformer installed. The utility would have only the added cost of metering when providing 3-phase power to the customer. It would have to charge only a very small amount more for 3-phase service. Costs for the 265/460-v underground system are in Table I.

Certain economies could be obtained in the 265/460-v underground system by using pole-mounted, three-phase, 75-kva transformers in place of the garage-enclosed substation. The transformers would be mounted on the 13.8-kv pole line running along the middle street in the 12-block area. This substation also would reduce somewhat the required footage of conduit, trenching and back-filling. A system using pole-mounted transformers to serve a 12-block area would cost $30,347, or $856 less than the system with the enclosed substation. It is suggested here only as a possible economy and is not considered further in this article.

Garage-Type Housing for Substation

To serve this area underground with a conventional 120/240-v, one 13.8-2.4/4.16-kv wye substation would serve a 24-block area. It could also be enclosed in a garage-like enclosure. For a demand of 6.5 kv per customer and 75-ft frontage, one 2,400-120/240-v transformer should be installed per block. No. 2 copper secondary should connect each transformer location with service pedestals. Layout for this system is shown in Fig 3.

One additional transformer housing should be installed per block to allow for a future ultimate load of 18 kva per customer. Cost details of this system based on a 12-block area are listed in Table II.

Installed costs of the three systems are compared in Table III. Note that the 265/460-v system offers a saving of $10,255 over the conventional underground system for 75-ft frontage, but only $2,438 for 150-ft lots. For a comparison of the economics of the three systems, annual charges on a per customer basis are tabulated in Table IV. Included in this analysis is the net revenue of 1.3¢/-

TABLE II — Cost Estimate for 2.4/4.16-kv Underground System

	75-ft Frontage	150-ft Frontage
4,160 ft No. 4 5-kv unshielded cable @ $550/1000 ft	$ 2,288	$ 2,288
4,040 ft No. 2 5-kv unshielded cable @ $750/1000 ft	3,030	3,030
19,760 ft No. 2 RR cable @ $365/1000 ft installed	7,222	.....
5,100 ft No. 2 TW @ $290/1000 ft installed	1,479	.....
4,160 ft No. 4 TW neutral @ $160/1000 ft installed	.....	672
4,040 ft No. 2 TW neutral @ $290/1000 ft installed	.....	768
8,880 ft 2-in. Non-metalic conduit @ $51/100 ft	1,518	1,518
24 Transformer housings @ $410 installed	9,840	9,840
24 Service pedestals @ $150 installed	3,600	.....
45 Bayonet-type switches and fuses @ $30 installed	1,350	1,350
8,600 ft Trench and backfill @ $20/ft	1,720	1,720
12 25-kva Transformers @ $480 installed	5,760	.....
12 15-kva Transformers @ $380 installed	.....	4,560
One/half 13.8—2.4/4.16-kv, 750-kva substation	4,270	4,270
Total	$42,077	$30,016

TABLE III — Installed Costs of Underground and Overhead Systems

Design Kva per Customer	Lot Frontage	265/460-v Underground	Conventional Underground	13.8-kv Overhead
6.5	75	$31,203	$42,077	$20,948
8.3	100	29,498	35,477	18,488
10.2	150	27,578	30,016	17,428

kwhr from the core loss of a 10-kva dry-type transformer. Because copper loss cost is approximately the same as the bottom step of the residential rate, it is not included. Note in Table IV that the 265/460-v underground system has the lowest cost for serving 75-ft lots if the customer runs his own service and installs and owns a 10-kva, 480—120/240-v transformer. For all other conditions, the overhead system has the lowest cost.

Annual operating expenses of the three systems for a 12-block area are shown in Table V. The conventional underground system costs $5,550 more annually than does the 265/460-v system for 75-ft frontages. And for lot frontages of 150 ft, the conventional underground system costs $1,618 more annually.

Against this background of cost advantages it is advisable to look at factors that may offset the claimed disadvantages of the 265/460-v wye system.

TABLE IV — Economics of Underground and Overhead Systems

	Underground		Overhead
	265/460-v	Conventional	13.8-kv
Lot Frontage, 75 ft			
Fixed annual charge*	$21.80	$34.20	$17.00
Cost of losses	5.03	5.19	4.74
Revenue from 10-kva dry-type transformer	(7.08)	.....	.....
Metering Costs	4.85	4.17	4.17
Total Cost	**$24.60**	**$53.56**	**$25.91**
Lot Frontage, 100 ft			
Fixed annual charge*	$27.50	$38.40	$25.91
Cost of losses	5.08	5.19	4.74
Revenue from 10-kva dry-type transformer	(7.08)	.....	.....
Metering cost	4.85	4.17	4.17
Total Cost	**$30.35**	**$48.76**	**$28.91**
Lot Frontage, 150 ft			
Fixed annual charge*	$38.40	$48.80	$26.10
Cost of losses	5.13	5.19	4.74
Revenue from 10-kva dry-type transformer	(7.08)	.....	.....
Metering Cost	4.85	4.17	4.17
Total Cost	**$41.30**	**$58.16**	**$35.01**

*Taken at 13.4% for the 265/460-v system; 15.6% for others.

TABLE V—Annual Operating Expense Underground and Overhead Systems

Lot Frontage	265/460-v Underground	Conventional Underground	13.8-kv Overhead
75	$4,723	$10,273	$4,975
100	4,370	7,011	4,163
150	3,965	5,583	3,361

Claims Against 265/460-v System Offset

1. Dry-type transformers may have objectionable noise levels. Future developments in dry-type transformers should enable manufacturers to eliminate objectionable noise. Certain manufacturers indicate this problem cannot be solved without an increase in transformer prices. But research and new materials will meet this problem satisfactorily. If not, mass production of a new design will make the price reasonable.

2. National Electric Code will not allow outlet voltages exceeding 150-v above ground. European systems have operated at 220-v above ground for some time with no serious problems. Developments in the design of outlets may eliminate the 150-v-above-ground code objection to fixed appliances.

3. The 240-v appliances rated 150 v above ground are standard.

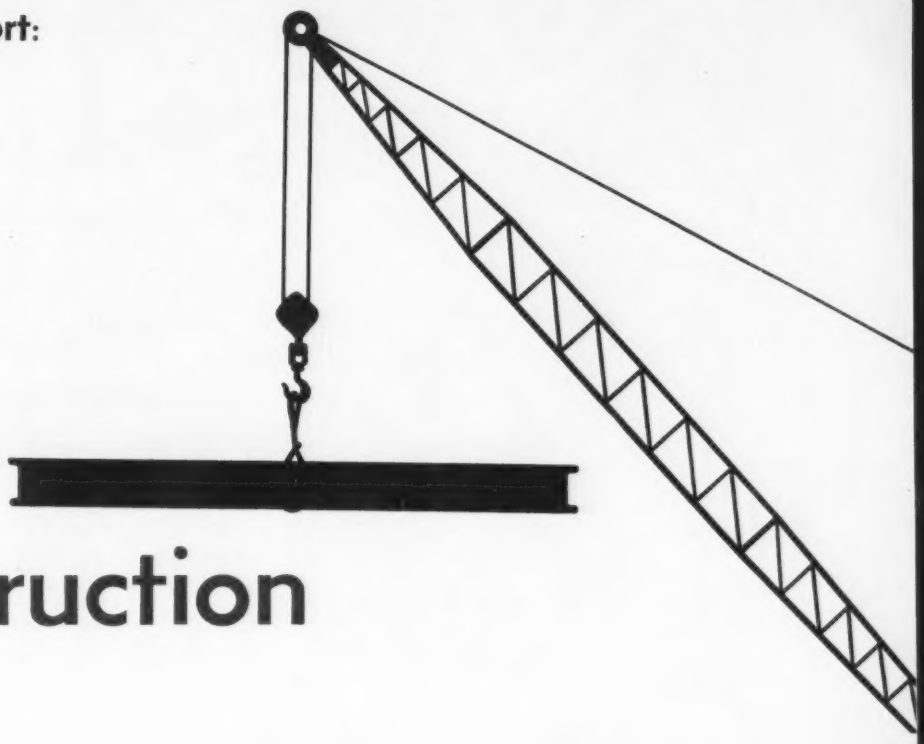
Commercial establishments will be served in increasing numbers at 265/460-v. Therefore, there is a possibility of 265 or 460-v major appliances and electrical house heating units.

4. The 227/480-v transformer will require another size for stocking purposes. A transformer rated 277/480-v wye secondary voltage is a much better "standard" transformer than the 480-v transformer. It can provide a definite voltage above ground, thus eliminating the dangers associated with winding-to-winding failures in transformers. It is also possible that the present 120/240-v transformer may be uprated to 138.5/277-v in the future.

5. Three-phase motors with 3-4% voltage unbalance will impose problems of motor burnout. The 265/460-v system has a maximum design drop of 5.6%. With a 100% load on phase A, 133% load on phase B, and 67% load on phase C, voltage unbalance is 2.26%, which should not adversely affect motor operation.

6. A 460-v system has greater losses. It is true that a 480-v underground system has a somewhat greater loss cost than has the conventional 120/240-v overhead distribution system. Annual loss cost to serve a 12-block area with a 40-kva-per-block load density and 75-ft lot frontage is $909.20 for an overhead system compared to $965 for the 265/460-v system if metering is accomplished at 480 v.

A Special Report:



New Construction Ideas Cut Expansion Costs

FRANCIS J. KOVALCIK, Pacific Coast Editor

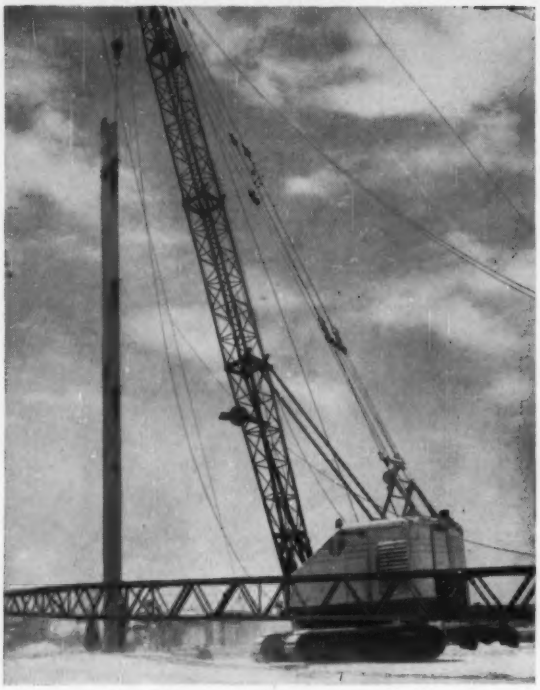
The big challenge that faces construction forces engaged today in expanding the nation's power systems is to build better, faster, and at lower cost than ever before. This challenge is sharpened by the mounting volume of building that must be done by a labor force that is growing at a slower rate.

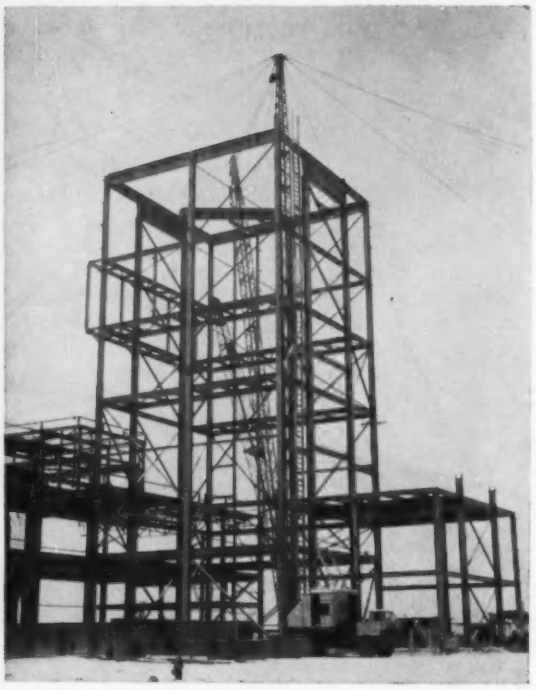
Construction men are meeting this challenge with new ideas, new methods, and the manufacturers with new machines. Some of these new ideas are contained on the pages of the special report that follows. The editors make no pretense that these are all of the new ideas being used in utility construction today, or necessarily that they are the best ones. Instead, an attempt has been made to present a diversified picture of the new methods used to build today's steam, hydro-electric, and nuclear power plants; substations and transmission lines; and cable systems.

Here is to be found even further testimony to the ingenuity and the know-how of the American construction man as he pits his skill against high costs, short labor forces, time, weather, and the "innate cussidness of inanimate objects" in an effort to execute the designer's plans according to design, on schedule, and within the estimated budget.

In This Report . . .

9 Ways to Lower Construction Cost . . . . . page 110
Winches Guide Paving Machines . . . . . page 112
Nuclear Plant Construction Needs Special Care . . . . . page 114
Aluminum Welding Cuts Cost 30% . . . . . page 114
String All-Aluminum Under Tension . . . . . page 117
Mechanized Methods Build 115-kv Line Over Wet Terrain . . . . . page 120
Lay 4-Mile Cables in 2½ Hours . . . . . page 123
Precast Form and Cover Speeds Cable Relocation . . . . . page 124





At Cunningham Station steel went up in 2½ weeks. Welding was one of . . .

9 Ways to Lower Construction Costs

Southwestern Public Service uses new ideas, such as trolley duct for crawler crane and boiler tubes in panels. New methods include prime coating concrete to speed clean-up, early use of permanent lighting

Southwestern Public Service Co, Amarillo, Tex., is shooting for the minimum dollars/kw in the construction of its 70,000-kw Cunningham steam plant near Hobbs, N. M. The unit-design plant initially will have one 3,600-rpm, 1,250-psi, 950-F, tandem-compound double-flow turbo-generator and will be fired by natural gas. Here are some of the ideas and methods used in construction to achieve minimum installed cost:

1. Design all-welded turbine room and boiler structures. Welding of steelwork instead of riveting is expected to save 50% of erection costs. For an almost identical but riveted turbine structure in another company plant, the cost was $9,740. When welding stood 75% complete at Cunningham, the cost had run to only $2,774. And erection time for turbine and boiler structures was cut from an estimated 6 weeks for riveting to 2½ weeks for welding.

In the welding operation, a one-man crew can join as many members in the same time as can a four-to-five man riveting crew. Welding requires a certain procedure —chasing the stresses around the steel—to prevent the building up of stresses. Welders start at the middle of the structure and work out toward the perimeter.

To obtain proper welded joints, Southwestern Public Service tests welders at the plant site before accepting them. Tests consist of welding flat pieces of plate in horizontal, overhead and vertical positions. Two coupons from each sample weld are bent almost 180 deg—one root bend and one face bend—to determine their adequacy. A similar test must be passed by pipe welders.

2. Prime-coat concrete to reduce clean-up time. Concrete work, including foundation walls and turbo-generator foundation, is given its prime coat of paint as soon as the concrete is set and properly dried out. The primer coat prevents dirt, grease, and oil films from penetrating the concrete and discoloring it. And this foreign matter can be cleaned more easily as work progresses and before the final coat of paint is applied.

3. Trolley-duct eliminates need for barriers. Serving the overhead crane at Cunningham Plant is a trolley duct instead of an open-wire installation. The enclosed conductors remove the hazard to men working around the energized trolley line. Expense and time of handling barriers around an open energized system were completely eliminated.

4. Boiler tubes in panels reduce erection costs. The manufacturer of the boiler assembled and delivered tubes for the boiler in panels. It is expected this practice will cut boiler erection time by 10%.

5. Minimize temporary lighting systems. In the construction plan for Cunningham Plant, it was found that permanent lighting systems could be used soon after circuits were installed and fixtures arrived. Installation and use of permanent lighting reduces the need for and handling of temporary lighting systems and eliminates the hazards associated with temporary systems.

6. Erect boiler components with crawler crane. Use of a crawler-type crane inside the boiler structure can reduce significantly the time required to lift and position such boiler components as hot-air and hot-gas ducts, mud drum, downcomers and burners. (See EW, Jan. 9, 1956, p 102). The crane is positioned at ground level directly under the ultimate location of the furnace.

7. Delay placing wall siding to eliminate damage. Cunningham Plant will be enclosed by a steel liner panel, an insulating layer of 1½ in. of glass fiber, and aluminum siding. The steel liner was placed after the structure was completed to enclose the building. The insulation and siding are installed at the latest possible date to finish the exterior. This practice eliminates the need to repair siding which may become damaged during construction.

8. Use progress photos to assure prompt delivery. Southwestern Public Service takes construction-in-progress photos about once a week, plus photos of heavy equipment arriving, being unloaded, and being raised or positioned. Photos are sent to manufacturers of equipment due to arrive as proof that construction is on schedule. Photos are also taken of equipment as received to substantiate possible claims against shippers. Finally, photos are taken of underground crossings of pipes and conduit before they are backfield. This photo record accurately shows the location and position of underground lines.

9. Backfill with excavated material. The site for Cunningham Plant consists of a layer of topsoil and 3 ft of rock resting on a bed of limestone (caliche). Rather than haul material from distant points, the company set up a crushing plant and broke up the limestone as it was excavated. The crushed stone was stored for later use as backfill and for road foundations.

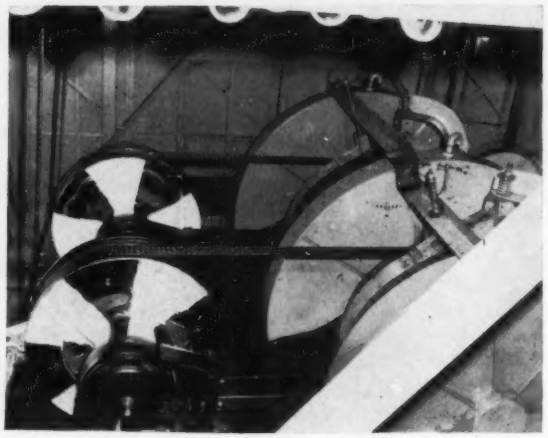
WELDING OF JOINTS saves time and money over riveting. One welder does work of a four-to-five man riveting crew

TROLLEY DUCT for overhead crane removes hazard of open-wire trolley and need not be barricaded for work in the area

PANELS OF BOILER TUBES are assembled by the manufacturer before delivery. Panels will cut erection time by 10%

CRUSHED LIMESTONE for backfilling and road foundations was prepared in on-site crusher during plant excavation

New Methods Build Dam Faster

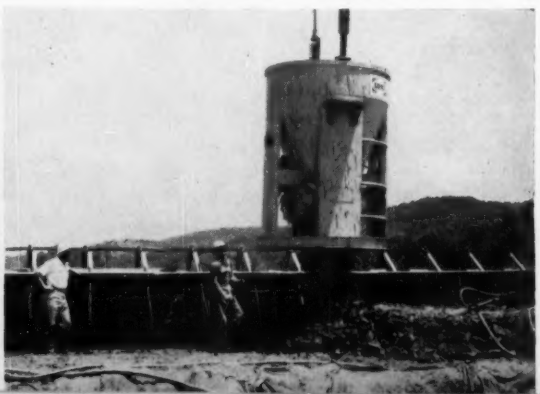


1. Television quickens operation at the Corps of Engineers' Table Rock Dam on the White River near Branson, Mo. The TV system controls the main aerial cableway carrying concrete buckets to the spillway. Heart of the system is a home-type receiver (above) in the cableway operator's control house, which is on the same tracks (upper right) as railroad cars delivering buckets from the mixing plant. Coaxial cable links receiver to a camera in the hoist house, 2,000 ft away across the river. The camera is focused on two hoisting drums (lower right) operating the cableway. Drums either must be stopped or turning at the same speed to be engaged by their motor. The operator controls the hoisting mechanism by watching his TV. Looking out of his control house, he handles buckets on the delivery cars.

All photos courtesy Morrison-Knudsen Co

2. A new type of box-truss, cantilever steel form is used for mass-concrete placement. Forms were conceived by B. Williams, vice president, Morrison-Knudsen Co, for use on upstream and downstream faces of the spillway section after the Corps of Engineers approved the use of 7-ft lifts. Forms are built in two sections that are 15½-ft high when bolted together. Each section is hinged in the middle so that the top half can be folded back to provide easy access for the cableway bucket. After a lift is cured, the bottom section is "leapfrogged" upward by a crane and bolted for a new pour.

3. Experimental use is being made of a hydraulically-dumped 4-cu yd concrete bucket. The new bucket is expected to increase substantially the rate of concrete placement at the dam. The new unit incorporates two cylinders in the mounting mechanism. Weight of the loaded bucket develops an oil pressure which is used to trip the gates. It is planned to equip the bucket with a radio receiver which will activate the gate tripping device. The receiver will be energized by the operator through a transmitter. This will eliminate the lowering of the bucket to operator level prior to pouring.



ASPHALTIC CONCRETE is applied in 3-in. layer for erosion protection on the upstream face of the dam. About 7,800 tons of mix was spread at rates up to 650-700 tons per day

WINCH LINES pull truck loaded with 5-6 tons of asphaltic mix into position and control movement of 12-ton paver. In background, 3-ton roller also is held by winch line

Winches Guide Paving Machines

Control and movement of equipment by winch lines was largely responsible for the paving rates of 650-700 tons a day on a 3:1 slope achieved at Los Angeles Dept of Water & Power's Lower Stone Canyon Dam. On a slope of 2:1, about two-thirds of this progress rate was made. In all, about 7,800 tons of asphaltic concrete pavement was spread in a 3-in. layer over 433,360 sq ft, of which 40,400 sq ft was on about a 2:1 slope and the remainder on a 3:1 slope.

The asphaltic pavement was applied on the upstream face for erosion protection rather than for watertightness. This permeable paving was chosen to eliminate possible heaving under hydrostatic forces as the water level fluctuates. Subgrade preparation, after removal of over-fill, consisted of fine grading with motor graders operating parallel and transverse to the direction of slope. On slopes steeper than 3:1 it was necessary to support them by a cable and bridle attached to a tractor and winch on the 30-ft crest roadway. Following fine grading, the subgrade was air-blown or broomed to remove loose material.

Asphaltic paving mix of an open-graded aggregate combined with 5-7% of 60-70 penetration asphaltic cement was placed at temperatures between 250 and 325F. Paving was laid in 10-ft strips up the face of the dam from bottom to top. Placing equipment was a standard 12-ton paver, charged with 5-6 tons of mix to hold about 18 tons.

Because of the weight and to move the paver safely and smoothly, it was necessary to winch the unit up and down the slope. This was done with a tractor and heavy-duty winch capable of handling up to 400 ft of ¾-in. cable. This equipment was set on the crest roadway. Maximum length of cable was 350 ft.

Paving mix was hauled to the paver in 8-ton dump trucks which approached the job at the bottom of the slope. Trucks were hauled by cable up the slope to a point past the paver, then across the paver cable and back down against the paver. The two units then were hauled up the slope together, the paver cable controlling the load.

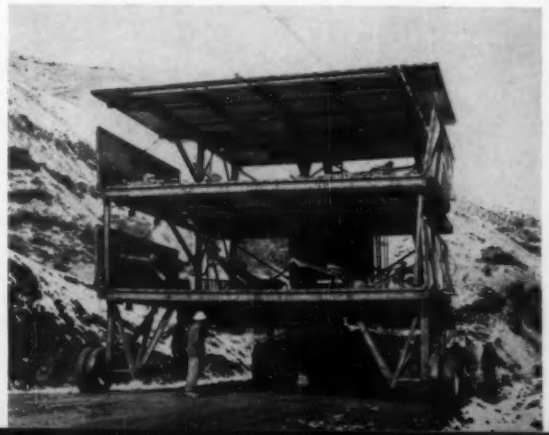
Although the trucks could negotiate the 3:1 slope on their own power, the cable increased control of their movement and the safety of the operation, and reduced the tearing effect of wheel traction on the subgrade. Hoisting equipment for the trucks was a 25-ton truck crane on the crest roadway. Normally about ten truckloads of material were required for one strip from bottom to top.

4-Level Jumbo Mounts 15 Drills

Four-level drilling jumbo built by the contractor speeded drilling of the 2,555-ft long, 38-ft horseshoe-shaped diversion tunnel for the Brownlee project of Idaho Power Co on the Snake River. The jumbo holds 15 drills and is mounted on an end-dump truck. The unit worked at both ends of the tunnel alternately with the earth-moving crew.

While the jumbo was drilling at one end, the earth-moving crew was blasting and excavating at the other end.

In excavating the tunnel, it was estimated that 100,000 cu yd of solid rock would be removed.



Nuclear Plant Construction Needs

- Structures for thermal and biological shields must meet rigid design specifications in every detail
- High-density concrete has magnetite iron ore as aggregate—magnetite is 64% iron with average specific gravity of 4.6
- Sodium piping and system are traced with electrical resistance heaters and sodium lead detector system

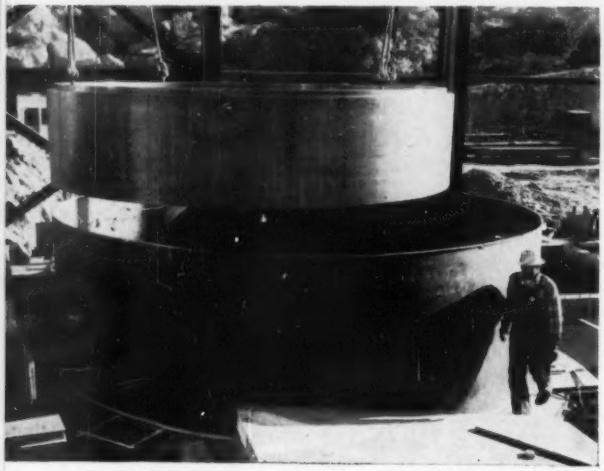
R. L. OLSON, Chief Project Engineer, Atomics International, North American Aviation, Inc., Canoga Park, Calif.

Systems and components for handling radioactive materials in a nuclear reactor require particular attention during construction. Structures which will serve as thermal and biological shields must meet rigid design specifications. This approach is being taken by Atomics International in building of the nation's first liquid-metal-cooled, central-station-type, nuclear power plant in the Santa Susana Mountains, 30 miles northwest of metropolitan Los Angeles. This sodium-cooled, graphite-moderated reactor, which will produce 21,000 kw of heat energy, is part of the AEC's program to develop economical power from atomic energy.

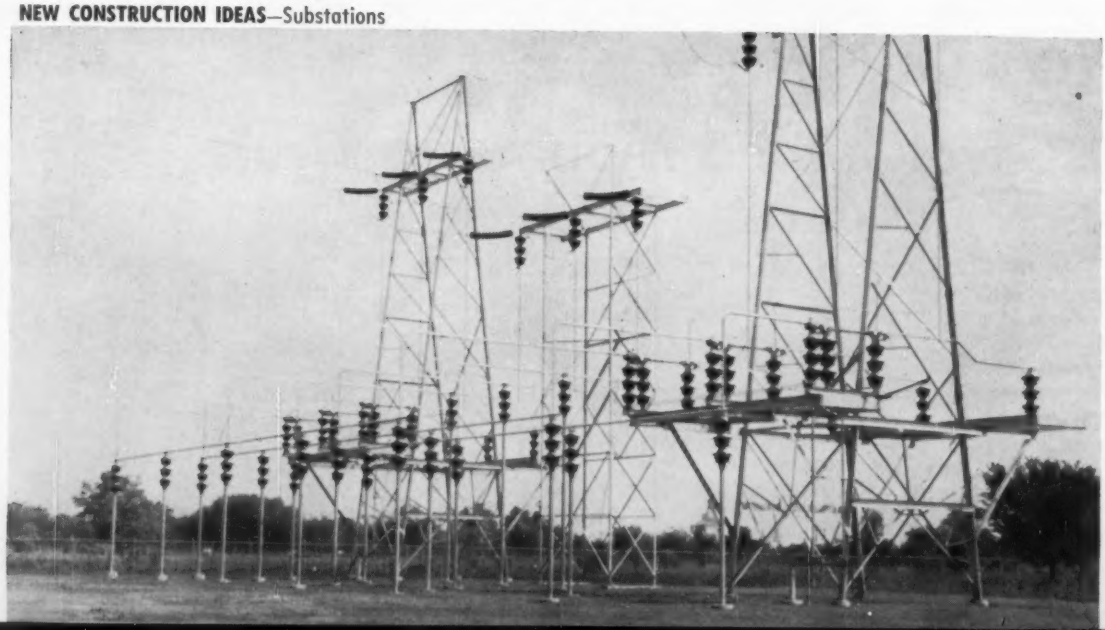
Arrangements are underway with Southern California Edison Co to provide a 7,500-kw turbogenerator for utilization of heat in the reactor's secondary sodium circuit for power production. The project will demonstrate the feasibility of this type of reactor for power production, including the testing of a variety of fuel elements, as well as providing operating maintenance experience. Construction of the reactor and building substructures started in March, 1955. The reactor goes critical this year

Building walls are precast tilt-up concrete panels, supported by steel framing, to form a relatively air-tight shell. Concrete wall panels are 5½ in. thick, the largest weighing about 16 tons and measuring 20 x 25 ft. Much of the radiation shielding will be high-density concrete using magnetite iron ore as aggregate. The magnetite is 64% iron with an average specific gravity of 4.6. It was crushed and graded to three sizes: coarse, 1½ to ¾ in.; medium, ¾ to No. 4; and, fine, minus No. 4 The heavy concrete exceeds 220 lb/cu ft and has a 28-day compressive strength above 2,000 psi.

Strength and density of the heavy concrete are checked



DUST COVER with a removable roof isolates the core cavity from surrounding activity. Rings weigh 10 to 12 tons



Special Care

with conventional test cylinders and with 12-in. cubic blocks, prepared according to the design mix. Strength and density are checked also by standard test cylinders taken frequently during pours. Prior to pouring all forming, it is inspected dimensionally and checked against shielding drawings.

Checks are made of large and heavy removable shielding blocks which must fit quite closely with the monolithic foundation and shielding walls. Extensive as-built dimensions of the walls are used in prefabricating the steel edge framing for the blocks. Frames then are installed and checked for fit or any rework. Then frames are removed and the forms are built to the frames and very thoroughly braced for the heavy concrete pour.

Circular shielding enclosing the top of the reactor consists of stainless steel shells prepacked with magnetite aggregate and grouted with cement and magnetite fines. Use of a crane-mounted electromagnet to separate the iron ore from the ordinary rock contained in initial shipments proved very expedient.

Main primary and secondary sodium circuits are of all-welded construction, using 6-in. type 304 stainless steel pipe. There are no flanged joints in the sodium system. All piping and components are welded, using an inert-gas-shielded tungsten-arc root pass, backed by an inert-gas atmosphere. Excellent results follow the use of consumable backing rings or the spaced root method, once welders are initially trained and certified. Filler passes are completed with consumable electrodes, maintaining the inert-gas backing to minimize oxidation.

All root passes are dye-penetrant inspected and the completed weld is 100% x-rayed. Prefabricated spools, fittings, and lengths of pipe are thoroughly steam-cleaned, rinsed with distilled water, air-dried, and sealed with protective end caps before assembly in the systems. Piping and cooling system components are leak-tested.

THERMAL INSULATION consists of 3-in. Superex blocks, sodium-silicate-coated to reduce dusting.

All sodium piping and sodium system components are traced with electrical resistance heaters and a two-wire sodium lead detector system. Any small leakage of sodium short circuits the detector wires and indicates the areas of the leak. Superex-type insulation encloses the piping and its tracing.

At Louisiana P&L's 110-13.8-kv Harahan substation . . .

Aluminum Welding Cut Cost 30%

- **Simplifies handling and procurement**
- **Makes permanent, minimum-resistance connection on bus, tap or support**
- **110-H-18 aluminum pipe combines conductivity, low cost, corrosion resistance and mechanical strength**

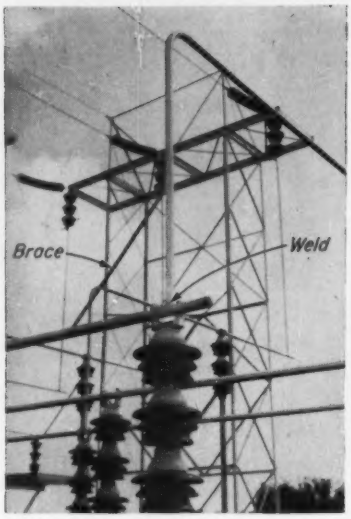
MORRIS J. STEINER, JR, Division Engineer, Louisiana Power & Light Co, Metairie, La.

Field welding of aluminum by an inert-gas tungsten process cuts Louisiana Power & Light Co construction costs and simplifies handling and procurement. At the 110-13.8-kv Harahan substation the process was used to make permanent, minimum-resistance connections on buses, taps, and supports. Estimated installed costs for four types of connections are in the table appearing on the next page.

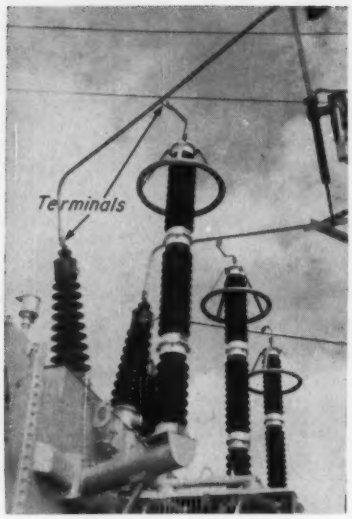
The gas-arc process uses argon to protect the weld zone from the atmosphere. Heat is provided by an arc struck between a tungsten electrode and the metal work piece. The electrode is not melted and used as filler but is melted into the weld zone as in oxy-acetylene welding.

The welder is rated at 200 amp and has power factor correction. Super-

Adapted from a paper at the Southeastern Electric Exchange Engineering & Operation Section meeting, Augusta, Ga.



HORIZONTAL BUS SUPPORT is only cast fitting used. Taps are welded to bus



EQUIPMENT TERMINALS consist of 10x 4x⅝-in. pads welded to tubing

VERTICAL BUS SUPPORT with tongue is made from aluminum pipe and plates

imposed on the welding voltage is a high-frequency voltage to help start and maintain the arc. Gas and water, which cool the torch and power cable, are conserved by automatic controls actuated as the arc is struck or broken. Where water is not readily available, a recirculating water cooling system is used. Total cost of equipment is about $1,600.

Grades of aluminum used are 1100F plate and 1100 welding rods. These alloys have the same melting and cooling characteristics as the 1100-H-18 aluminum bus material. Thus cracks caused by uneven contraction are eliminated. The 1100 H-18 aluminum pipe possesses the best combination of conductivity, low cost, corrosion resistance, and adequate strength.

Weld Main Bus at Center

Five types of welded connections and supports were designed for substation construction. A single, simple cast fitting is used for fixed and slip-fit horizontal bus supports. For the high-voltage bus, the main run is welded to the center support only. At other supports the bus runs free to allow for expansion and contraction. Total calculated movement at the free end of such a 100-ft bus in a typical 5-bay station is about 1½ in. per 100F temperature change.

Welding has simplified tapping 2-in. tubing to the main bus. To obtain a close fit, one end of the tubing is cut with a hole saw having the same diameter as the horizontal bus. After the tap is welded, ¾-in. tubing is welded 45 deg to both the tap and main bus for additional strength.

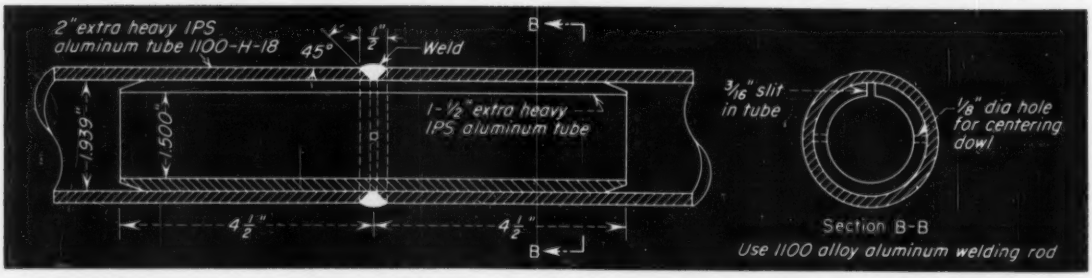
Saves in Connection Cost

This tap connection provides the greatest individual saving. With the other four welded connections and supports it helped reduce connection cost by about $338 at Harahan substation, where total welding costs were $762. These figures do not include overhead, stores handling and milage.

Company personnel were trained to use the special equipment for this job. Men with previous arc-welding experience attended a week-long class conducted by a local supplier.

Welding Cost for Four Types of Connections

Type of Connection	Estimated Installed Cost
Bus support and tee, 2½-in. run to 2-in. tap	$21.73
Vertical bus support with tongue for jumper terminal	$14.88
Splice, 2-in. tubes	$7.73
Switch terminal, 2-in. tube to flat	$7.23



TUBING SPLICE is made by inserting a smaller split tube into the larger tubing and filling gap with weld metal

Old 500-MCM rope-lay copper used on 142-mile, 220-kv line as pulling line to . . .

String 954-MCM All-Aluminum Under Tension

NORMAN M. SCOFIELD, Line Construction Supt, General Construction Dept, Pacific Gas & Electric Co, San Francisco, Calif.

Tension stringing with positive control at both ends of the pull is being used by Pacific Gas & Electric Co in the reconductoring of about 142 miles of its double-circuit 220-kv Pit-Vaca Dixon line. On this project, involving replacement of 500-MCM rope-lay copper conductor with 954-MCM 37-strand all-aluminum cable, the company is shooting at:

1. Pulling-in of aluminum with the old copper line under a tension of 4,500 lb at the rate of 4 mph.

2. Elimination of damage to the aluminum by keeping it off the ground through positive tension control.

Reduce Line Losses by 5,700 Kw

Attainment of the first objective will allow pulling in of about three miles (20 spans) of all-aluminum during each stringing set-up. And the goal of damage-free aluminum follows the initial aim of the project—reduction of I^2R and corona losses of the 34-year-old line by about 5,700 kw per circuit for loadings of 120,000 kw. Furthermore, the speed with which the copper (about 7 million lb) can be taken down will determine how much salvage value the company can realize by taking advantage of current metal prices.

To attain these objectives, PG&E is making the first use of two new tension pulling rigs. The rigs can attain a rated pull of 6,000-lb at up to 4 mph. Each truck-mounted machine has two power-driven bull wheels which have four Neoprene-lined grooves. Behind the wheels on the same frame is a power-driven mount which will take reels measuring up to 44 x 72 in. on which the pulled-in conductor or lead line is reeled.

For tension control at the braking end of the line, PG&E is using two trailer-mounted tensioners, each of which can handle two conductors. Two independent four-groove, Neoprene-lined bull wheels are set on each trailer. Each trailer is fed from one or two reel trailers which are equipped with reel brakes and can take up to an 84-in. steel reel. Pulling machines and tensioners were built by Petersen Engineering Co, Santa Clara, Calif.

This is how controlled tension stringing fits into the reconductoring project. On a given section of line, these different operations are done in sequence—unclipping of the rope-lay copper; stringing and sagging of the all-aluminum; and arm-changing and clipping-in.

Unclipping Crew Moves in First

In the unclipping phase, the first job is the spotting and building of bridging and guard structures. The unclipping crew follows to take down insulator strings, hang the conductor in travelers, and cut the main member of the original tower arms. The old 18-ft arms are being replaced by two half-arms to provide 1-2 ft additional clearance for the lighter and larger all-aluminum cable. This cable will swing farther under design wind and loading conditions than does the rope-lay copper.

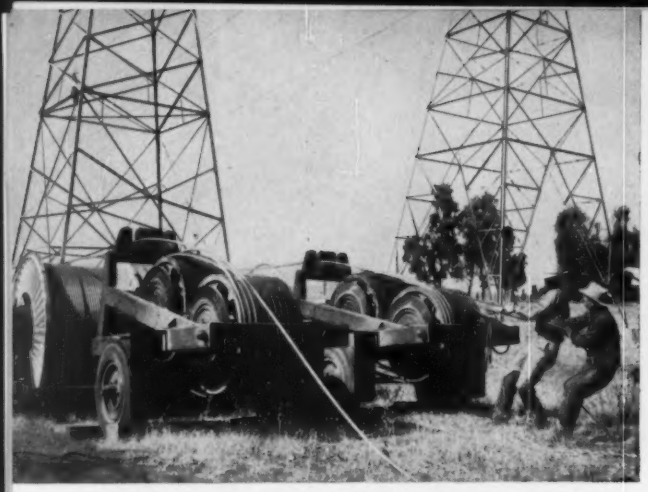
In the few cases where upstrains would occur if the all-aluminum were strung on existing towers, the towers will be taken down and re-erected on leg extensions. Installation of footings and re-erecting of towers is being handled by crews organized separately from the reconductoring operation. The tower crews will re-erect the towers with one circuit dead and the energized line removed temporarily onto a "shoo-fly".

String Two Conductors Together

On the heels of the unclipping operation comes the stringing crew. After the copper line has been lowered and cut at the pull terminals, this crew uses the pulling and braking rigs to pull in the all-aluminum with the copper as the lead line. Normally, the top and middle phase wires are pulled in at the same time, one phase on each pulling rig. Half-way through the pull, the loaded copper reels are lifted from the rigs and stored temporarily at the pulling end. Remainder of the copper is pulled onto a second set of reels.

For the third wire, each rig fills a reel by pulling in one half of the copper in the pull. At present, only one reel of all-aluminum per phase (about 8,800 ft) is pulled in during a set up. As the stringing crew becomes more

The reconductoring job step-by-step is shown on the next two pages ▶



TENSION RIGS each can hold two cables under tension during stringing. One rig is fed by two cable trailers, the other by a third. All trailers are deadended to one pole.

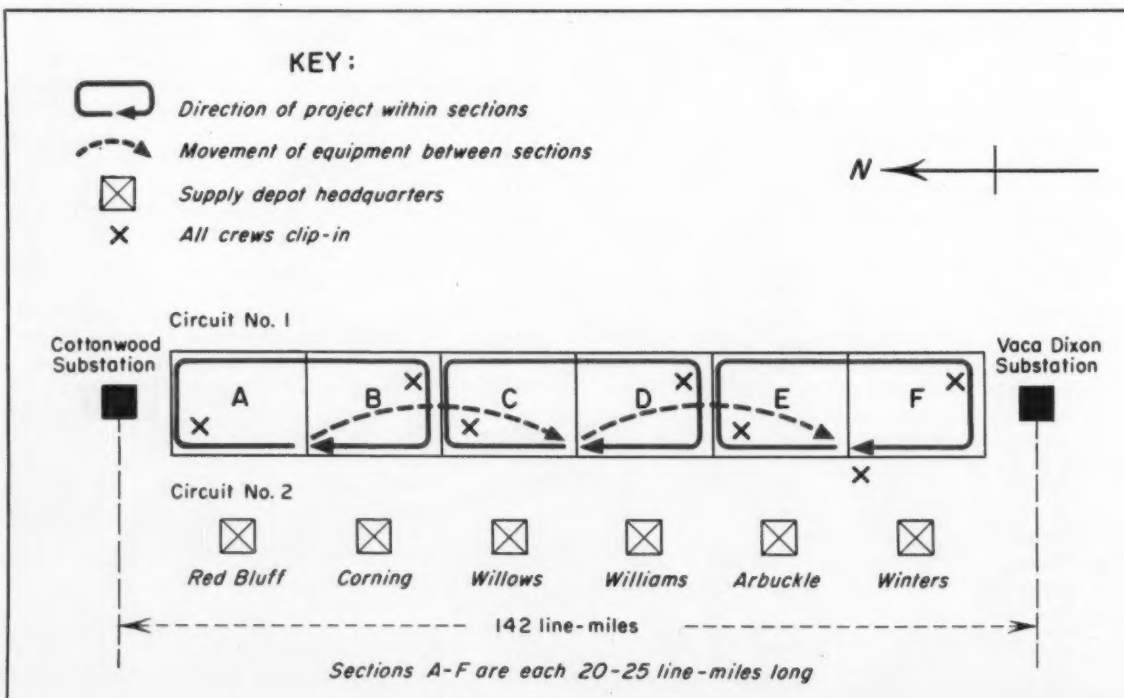
PULLING SPLICE between all-aluminum and rope-lay cables is made up with preformed steel guy grip. This splice rode over travelers in ten spans satisfactorily

familiar with the operation, two reels (about 3 miles) of all-aluminum may be pulled from each set-up. After the pull is complete, the all-aluminum is spliced to the preceding pull and the line is sagged.

In the first phase of the arm-changing and clipping-in operation, one crew assembles the new half crossarms (for both circuits) at the base of the tower. Crossarms are left for the clipping-in crews, which take down the old arms, raise the new half-arms for one circuit with insulators attached, and mount them on the towers. Armor rod and dampers are installed when the all-aluminum is clipped in.

One consideration in the reconductoring operation is the possibility of having to return the de-energized circuit on the double-circuit line to service within a minimum of time. To meet this requirement and still have an efficient operation, about eight miles of one circuit, from initial unclipping to final clipping-in, have to be in process of being reconductored. A plan for working on circuits 1 and 2 alternately within six sections was devised, as described in the accompanying illustration.

By working on the two circuits alternately, the reconductoring project requires only seven line clearances. Except on one circuit in the first and last sections, each



FIRST USE is made of two new pulling rigs which pull-in the rope-lay copper and reel it up in one operation. Each rig can develop a 6,000-lb tension at speeds up to 4 mph

ALL-ALUMINUM SPLICE is made with 40-ton press after conductors are pulled-in. Then the entire pull of about 8,800 ft is sagged to about 27% of ultimate strength

clearance covers work in two adjoining sections of line. The working plan requires only two major moves of heavy equipment from one section to another. It may have crews working in a main rice-growing area at a time when the land is being dried out for harvesting.

The alternate-circuit working plan also means that only one section at a time will have towers with unjoined main crossarm members. For as the second circuit in each section is clipped-in, the clipping crew attaches a splice plate between the main members of the new half-arms on the towers.

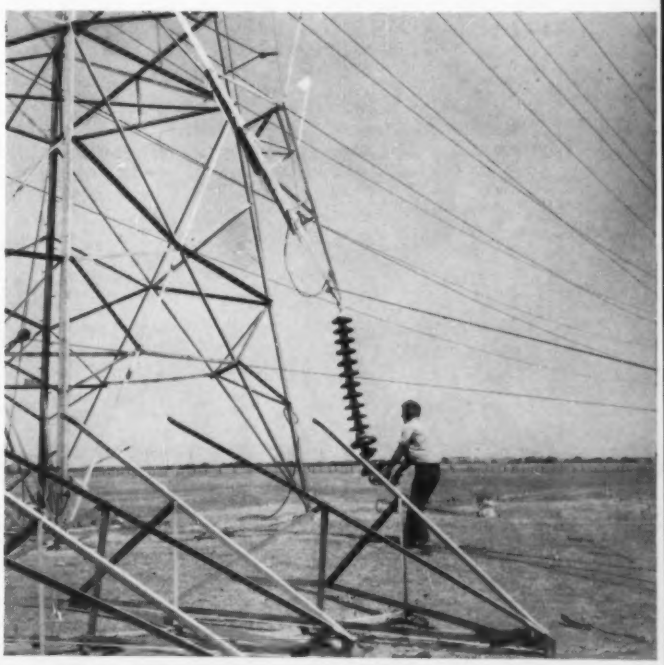
Materials handling and storage for the project is being expedited through the use of six material depots along the 142 miles of right of way. Advantage is taken of rail heads, main highways, and company property for the location of the storage yard within or near the six towns designated as working headquarters. Where the company does not own suitable property, the land is being rented for the length of the job in that section.

The alternate-circuit working plan will eliminate renting of land for the entire period of the project. The plan allows each yard to be set-up, used and cleaned-up only once while reconductoring is going on in the section served by the yard.

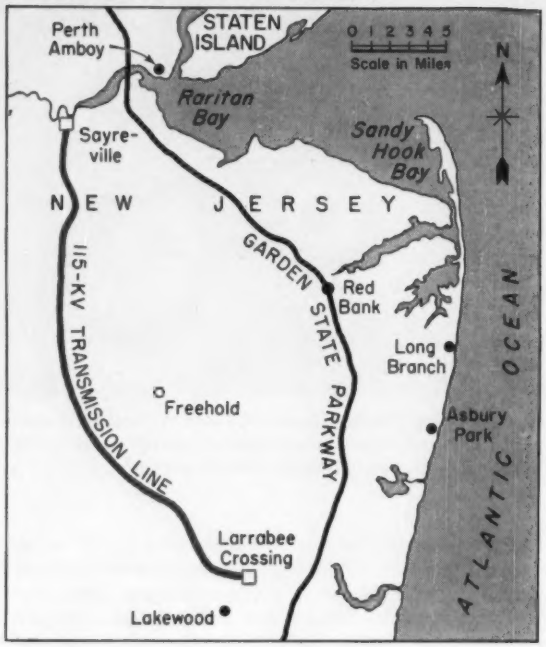
Working Plan Reconductors Alternate Circuits by Sections

Circuits No. 1 and 2 of the 220-kv Pit-Vaca Dixon line are being reconductored alternately by sections as shown in the accompanying illustration. The project starts at the south end of circuit No. 2 in section A and proceeds north to Cottonwood Substation, then moves south on circuit No 1 to the end of section B, and finally works north on circuit No. 2 in section B. As this circuit is being clipped-in, all heavy equipment is moved to the south end of section C, where the plan is repeated. At the ends of sections indicated by X, both the unclipping and stringing crews stop their normal work and help with clipping-in.

Use of the alternate-circuit plan allows each supply depot to be closed out as work ends in its respective section.



CLIPPING-IN CREW installs new half-arms after taking old arms down. As the second circuit is clipped-in, the crew attaches a splice plate between main members of the arms



Mechanized Methods Build 115-Kv Line Over Wet Terrain

Labor-saving ground driver, pole erector, and power digger pay off in building line through swampy terrain. Keep cost of 33-mile double-circuit line to $1.7 million

TRANSMISSION LINE consists of twin circuits 33 miles in length. About 70% of the right-of-way was through swamps

W. M. ROSE, General Superintendent, Transmission & Distribution, Jersey Central Power & Light Co, Asbury Park, N. J.

Use of mechanized line construction methods has enabled Jersey Central Power & Light Co to build a 33-mile, 115-kv twin-circuit transmission line through a swampy terrain at a cost of about $1.7 million exclusive of right-of-way. The line runs from the Sayreville (NJ) station to a substation at Larrabee's Crossing near Lakewood, N. J.

Among the mechanized equipment used were:

1. Self-contained, and self-propelled ground driver.

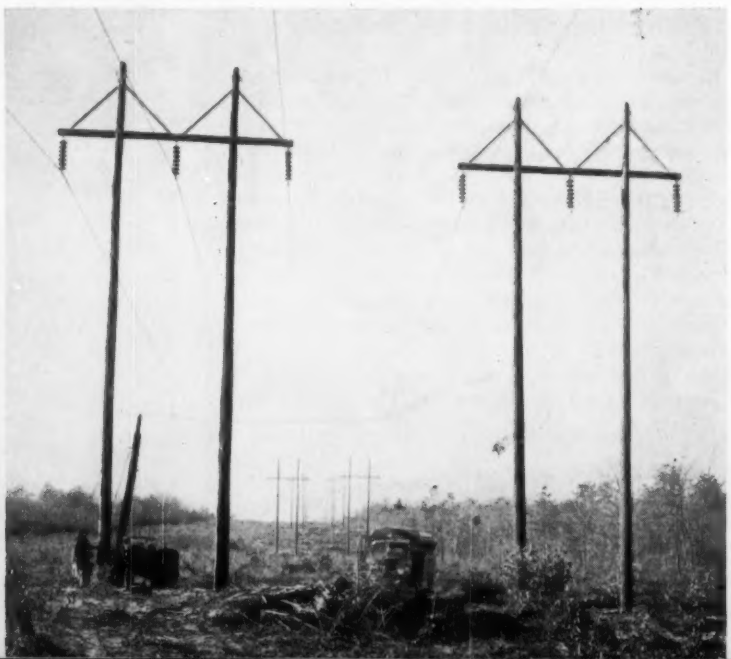
2. Caterpiller-mounted derrick.

3. Power digger mounted on rear of 4-wheel truck.

The ground driver is an adaptation of a commercial pneumatic drilling rig and is actually larger and more powerful than was required for the project. It is modified with a guide bar and self-releasing fingers which align and hold the ground rod in position while it is being driven by the pneumatic hammer. A hydraulic system positions the driver. It can be

PNEUMATIC HAMMER drives rod held by guide bar and self-releasing fingers

MECHANIZED EQUIPMENT was a great aid in building the line not only because of the savings involved but also because of character of route



held at any angle from horizontal to vertical. For utility line work, two positions are most useful—horizontal, for moving from place to place; vertical, for actual driving operations. Modification of the equipment was a joint venture of the equipment manufacturer and Jersey Central Power & Light.

On the Sayreville-Larrabee Crossing line, 4,234, ⅝-in. diameter, 10-ft ground rods were driven with the device to depths of 50 to 100 ft for an average cost of $1.90 per 10-ft section. The ground driver has been used on ten additional jobs. Average cost has been $2.15 per 10-ft section, with a high of $3.05 per rod section for a small job involving only 95 grounding positions, and a low of $1.35 per section for another large job.

BULLDOZERS, POWER PUMPS, and cofferdams were used in pouring structural tower foundations in the swampy locations like these along the route

Drive 10-ft Rod in 30 Seconds

Data for these 11 jobs are: Total rod sections driven, 8,036; ground driver rental and maintenance, $6,956; labor and other equipment costs, $10,289; total cost, $17,245. A 10-ft rod section can be driven in about 30 sec with this pneumatic equipment. This is shorter than the time necessary to couple sections of the rod.

Wood H-frames were assembled on the ground complete with cross arms and insulators and then hoisted into position. By using the caterpiller mounted derrick, this operation could be performed even in the swampy area. Derrick could handle cedar pole assemblies 80-ft high.

The power digger was mounted on rear of an all-wheel drive truck. It has a 36-in. auger. Power for the digger was supplied by a separate engine.

The 795-MCM ACSR conductors were handled in the swampy land with either caterpiller tractors or 10-wheel trucks. Caterpiller tractors were also used to string the conductors.

Full tension compression splices were made with a 40-ton press and power-driven hydraulic pump. With this equipment a complete splice could be made in about 15 min. It is estimated that a hand-made splice would require one hour or more. Because of the inconvenience of supplying a portable source of electric power for the motor-driven pump, a special gas-driven source was provided for the splicing mechanism. This proved to be very advantageous in the swampy areas.

Bulldozers, power pumps, and cofferdams were used to handle tower foundations in the swampy areas that abounded along the route of the line.

LARGE BALLOON TIRES on tractor gave manuverability to ground-rod driver permitting its use even on swampy land

CATERPILLER-MOUNTED derrick erected completely assembled H-frames. Pole assemblies 80 ft in height were handled

Crossing Straits of Mackinac three tugs and barge . . .

Lay 4-Mile Cables in 2½ Hours

Laying of four 46-kv submarine-type cables across the Straits of Mackinac on June 6 tied Michigan's peninsulas electrically for the first time. The cables were laid continuously between terminal, without splices, from a barge moved by three tugboats. The cables interconnect the systems of Consumers Power Co and Edison Sault Electric Co. and will be used primarily for sale of power to Edison Sault. The installation also reinforces both systems in that area.

Four 90-ton Reels Bolted to Barge

Reels of cable weighing 90 tons apiece were transferred from rail cars to barge. Reels were bolted securely to steel beams under the barge deck so that they would not be lost should anything unforseen cause the barge to capsize. Maximum depth of water at the crossing is 253 ft. The barge was outfitted with two tall 8x8-in. wood masts which could be lowered vertically through wells in the barge. These masts when lowered "spike" the barge to the bottom and keep it stable. Otherwise the barge might thrash around in choppy water and foul rigging and other gear.

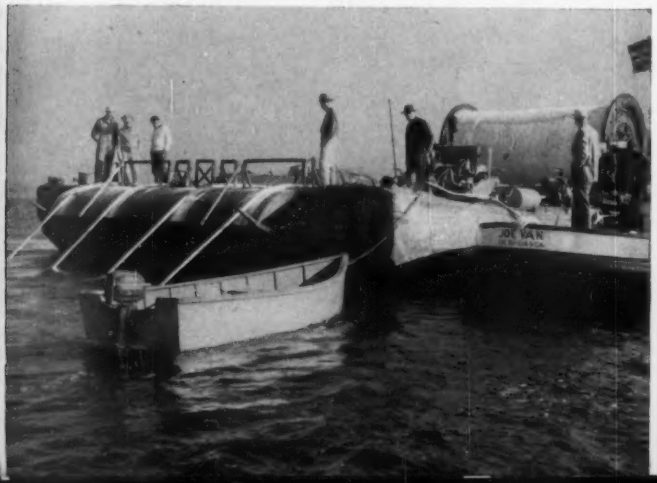
The loaded barge was positioned on the south side of the Straits at daybreak on June 6. The end of each cable was pulled ashore and anchored securely. At 7:10 AM a large tug began towing the barge across the Straits guided by targets set up on each side. A smaller tug boat on each side of the barge kept it on course.

Steel Frame Spaces Cables

Cables were payed out over the stern, being kept properly spaced by a steel framework welded to the stern of the barge. A coating of chalk-like lubricant kept the cables moving smoothly over the timber mat on the barge deck, over the steel frame, and into the water. Everything went smoothy except on two occasions when loose nuts on one reel interfered with the turning of the reel. A stop was required while the nuts were tightened but no harm was done.

When the large tug reached shallow water on the north

STEEL FRAMEWORK welded to the stern of the barge maintained separation between cables as they were paid out



STEEL BAND BRAKES on each reel were manned continuously to keep the cables under proper tension throughout the trip

STANDING OFF the south shore of Mackinac Straits as close as water depth permitted, barge is readied for the laying

CABLE ENDS are pulled ashore by tractor and made secure. Trench was blasted from rock about 500 ft into water

side, it was replaced by a small tug. This smaller boat pulled the barge near enough for attachment of a steel cable to a tractor on shore. The tractor pulled the barge into position. When the cables had been cut to proper length and their ends capped, the tractor pulled them ashore one at a time. This minimized the manual handling needed to bring the cables to the terminal.

Trenches Will Prevent Ice Damage

Cables were laid in a 500-ft trench blasted from rock offshore on the south side. They were laid in sand and rock for about 3,000 ft from shore on the north side. Trenches will protect the cables against ice, their lengths being determined by water depths and expected ice conditions. Cables also were laid in trenches for short distances from each shore to terminals.

Despite the delays, the trip across the Straits was completed in 2½ hours. Work on each side took several hours more. The interconnection was completed and energized early in July.

Public Relations Noteworthy

Noteworthy during the operation was the handling of public relations. More than 60 local civic leaders and members of the press were guests of Consumers Power Co at a buffet supper in Michigan City on June 5. The significance of this installation to the area was explained. Two boats were provided for observance of cable-laying operations. One boat for camera men was maneuvered at their request to give them the pictures they wanted. Another boat for writers and other observers was kept in good position during the activities.

Crossing Data in Brief

Crossing length	4 miles
Number of cables	1 per phase plus spare
Type of cable	Submarine, 46 kv, 1/C, No. 4
Conductor	19-strand, concentric round, copper
Insulation	445-mil paper, 105-mil cover
Jacket	One layer saturated jute, No. 8 BWG galvanized wire armor
Diameter	2.1 in.
Weight	7 lb/ft

SMALL TUG takes over as barge nears the north shore. Masts can be lowered to "spike" barge to bottom in rough water

CABLES ARE CAPPED and shaped wood block is placed inside armor to protect lead sheath as cable is pulled ashore

Precast Form and Cover Speed Cable Relocation

Precast concrete forms and covers provided a fast solution for four utilities that had to place underground two 115-kv and three 34.5-kv overhead circuits which crossed land chosen for expansion of the Lincoln, Neb., air base. The four utilities placed 2,600 ft each of three 34.5-kv, 250-MCM oil-filled cable circuits and two 115-kv, 250-MCM oil-filled cable circuits underground in a few months. Utilities involved in this operation were Consumers Public Power District; City of Lincoln; Norris Public Power District; and Loup River Public Power District.

Rerouting the lines overhead would have required new right-of-way and construction over a much longer route. The underground construction was devised as a means of completing the work within the time available. Cables were placed in five of six cableways provided by precast forms in a trench and covered with sand to protect them and permit movement. Form-fitting precast covers were placed over the cableways before backfilling. The sixth cableway was installed as a spare except where it was expected the trench could be opened in case of trouble. Oil pressure was maintained on the cables during the entire operation.

Two steel structures at each end of the cable runs were built as terminal facilities. These structures, for both the 34.5-kv and 115-kv cables, are equipped with transfer switches and bus so that cables can be disconnected in case of trouble and the load carried by cables in operation.

CONCRETE PAD 4 in. thick was poured from mixer moving a long trench. Pad was wide enough for 2 forms side by side

PRECAST FORMS were joined by placing rods from one form into holes in next form, with cement poured between forms

OIL-FILLED CABLES were unreeled from low-boy moving along trench. Oil pressure was maintained during the job

PRECAST COVERS were placed after sand had been spread over cables to protect them and permit movement

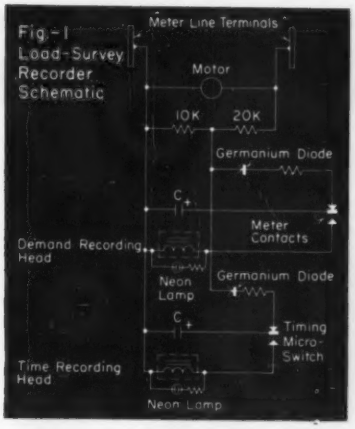
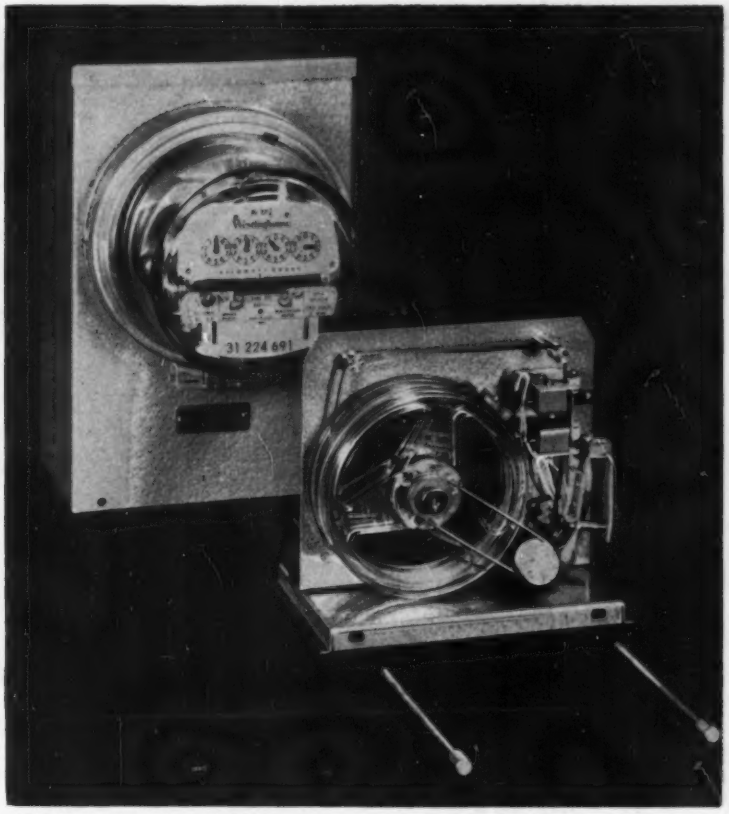


Fig. 1 Load-Survey Recorder Schematic

TODAY'S DESIGN TRENDS

Load Survey Data Recorded on Tape

T. D. BARNES, Engineering Manager, Meter Department, Westinghouse Electric Corp, Raleigh, N. C.



NEW LOAD SURVEY RECORDER makes use of a standard magnetic tape to record load and time data. The load recorder is easily installed on a consumer's service

A load survey recorder, utilizing standard magnetic tape to provide demand data, is now offered as a dependable, low-cost device easily installed on a customer's service. Furthermore, the recorded tape, bearing the load impulses and interval signals is processed automatically through a translator, and the data are fed directly to an IBM summary card punch machine.

System Long Needed

The new system was developed to satisfy a long-felt need expressed by the utilities and the EEI and AEIC rate and load research committees. Recent forecasts that the average residential kwhr consumption will double in the next decade have underscored the need for load surveys. System load curves are being altered as electric heating, air conditioning, and other appliance loads become more widespread. Seeking a sound basis for future rates, utilities must obtain timely, accurate data on the load characteristics of the modern electric home.

The new load survey recorder, now offered by Westinghouse Electric Corp, eliminates time-consuming labor and errors possible in the manual reading of charts. On one track of a standard magnetic tape, it records impulses proportional to load; and, on the other track, time interval impulses. Upon completion of a month's survey run, this tape is removed and processed through a translator. The latter totals the meter load impulses per time interval, thus providing demand values.

Demand data are fed directly and automatically to an IBM summary card punch machine, such as the IBM No. 526. In this machine the data

(*Continued on page* 128)

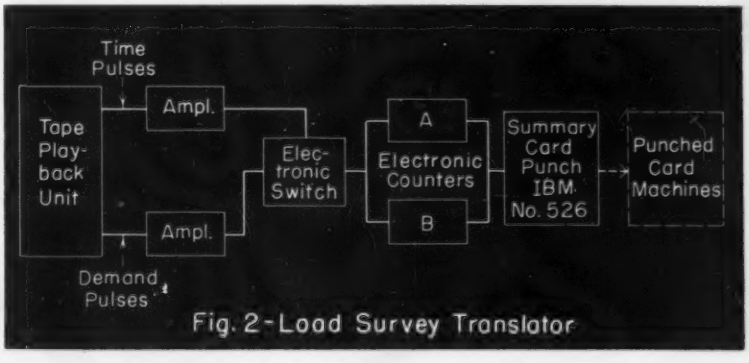


Fig. 2-Load Survey Translator

DISTRIBUTION TRANSFORMERS

THESE BRACELETS

COULD SAVE YOU...$210

Estimate your possible savings in terms of all transformers on your lines

Sometimes an ordinary transformer cover warps from uneven pressure because of careless tightening of clamps or bolts. If the cover has the usual cork or cork-and-rubber gasket, air can leak in. In one recent case-history moisture accumulated in the tank in less than a year, causing a short circuit between tank and windings. The failure cost $210 for the service trip and replacement of the 5-kva, 2400-volt unit.

G-E cover design prevents this problem. The one-piece stainless-steel clamping band and Nitrile rubber gasket on a G-E transformer maintain a tight seal for the life of the transformer. The band is tightened with only one bolt—pressure is thus uniform around the rim. The gasket resists air and oil, and continues to exert "back" pressure against rim and cover. Similar one-piece stainless-steel bands and Nitrile gaskets are used for bushings and hand hole covers. Factory sealing is thus maintained permanently.

Gaskets and bands are easy to remove. The Nitrile gaskets, furthermore, require no cement and can be used over and over again.

Look at the other money-saving features that prove "All Transformers Are Not Alike": **Impulse testing,** for instance, saves years of transformer life. **AL/CU terminals** are designed to prevent both copper and aluminum conductors from loosening. **Strenicor terminal clamps** save terminals from breaking. **Super Melaglyp paint** saves up to two repaintings. **Nationwide warehouses** save utilities heavy inventory expense. **Service shops** can cut your repair and rebuilding costs.

For the complete story, contact your nearest G-E Apparatus Sales Office or G-E Agent—or write to General Electric Company, Section 431-35, Schenectady 5, N. Y.

dollar-saving features prove ATANA*

*ALL TRANSFORMERS ARE NOT ALIKE
(make this simple comparison and see)

FEATURE	General Electric	Mfr. A	Mfr. B	Mfr. C	Mfr. D	Mfr. E
Production-line impulse testing	√			√		√
Nitrile rubber gaskets	√					√
One-piece clamping band	√					
H-v and l-v terminals handle both copper and aluminum conductors	√					
Strenicor pressure terminal clamps	√					
Super Melaglyp paint	√					
More than 100 warehouses	√	√				
Nationwide, company-operated service shops	√	√				

Progress Is Our Most Important Product

GENERAL ELECTRIC

Load Recorder

(*Continued from page* 125)

is punched on cards which have been pre-punched for identification. Initially, load survey recorder units will be available for single-phase, 3-wire, 120-240-v service in the following styles:

Styles Available

1. Socket type to replace customer's meter, complete with type DS meter and contact device.

2. Socket type, same as above, except that it has an additional socket for retaining the customer's meter in service for revenue billing.

3. Recorder unit in a separate box enclosure with flexible cable for connection to 3-wire, 120-240-v "A" base meters.

These units can take care of all single and double meter installations, except that in which a socket billing meter is mounted directly above a time switch or other meter. For such an installation a two-meter box is available which may be used in conjunction with a recorder.

Recorder mechanisms are interchangeable and are plugged in at the bottom of the enclosures. Recording units for polyphase socket meters will be made available as needed.

Standard Tape Used

As a recording medium, the survey recorder uses standard ¼-in. magnetic tape, which is readily obtainable, inexpensive, and reusable. Mylar-backed tape is recommended for its resistance to heat and humidity.

The tape transport system accommodates a 5-in. dia tape supply reel and a rewind reel. A synchronous motor turns the rubber surfaced tape drive capstan at 4 rph, resulting in a recording speed of 2.35 in. per 15-min interval. A standard 600-ft tape provides a 32-day record. Starting time of the tape record is set by adding a 1-day time-marked non-magnetic leader to the magnetic tape and setting the time of installation on the leader opposite an index pointer. Thus all recordings can be started at the same pre-selected time.

Production models will include a clock face and hands driven by the timing motor. This will be visible through a window in the enclosure and will indicate time lost through outages. The synchronous tape drive and timing motor are operated directly from the 240-v supply.

Voltages for watthour and timing pulses are obtained from voltage divider resistors and germanium diode rectifiers. The 3-wire contact device in the watthour meter connects a capacitor to the rectified voltage throughout the major part of its cycle of operation. An impulse is recorded by a contact operation which discharges the capacitor into the recording head. Maximum rate of watthour impulses is approximately 150 per 15-min interval, or 600 per hr.

The timing and the watthour circuits are the same, except that a single-pole, double-throw micro-switch actuated by the capstan drive shaft initiates the impulses. The contact device applied to the recorder meter is a 3-wire, quick-make, quick-break unit wired directly to the connection block. Neon pilot lamps connected across each recording head flash whenever an impulse is received, thus providing a visual check on operation.

Totals and Interprets

After the survey is completed, magnetic tape records are processed through a translator which totals and interprets impulses so as to control an IBM summary card punch machine. When a central office translator handles most operations and most variables, use of recording units is relatively simple, low cost, and dependable.

The translator is a floor-mounted unit in a relay cabinet about 36 in. high. Equipped with plug-in connectors for interconnection with the IBM machine, the translator consists basically of the necessary amplifiers, electronic switch and electronic counters to totalize the pick-up signals from the magnetic tape and to channel the signal to the proper summary punch keys.

Outages Accounted For

Tapes for processing must first be rewound. During the fast rewinding, one electronic counter is switched to count the time impulses on the tape. Reference to the times and dates of installation and removal indicates whether the tape record covers the whole period without outages.

Tapes are processed at 3-¾ in. per sec for 15-min interval demands, or 7½ in. per sec for 30 and 60-min interval demands. Demand interval is selected by a switch, setting the first electronic switch to operate on each time pulse, on every other time pulse, or every fourth time impulse. A 32-day, 600-ft tape can be processed in 35 min with 15-min intervals, or in 18 min with 30 or 60-min intervals.

Two counting channels are switched so that, while one is counting, the total on the other is transferred to the IBM machine for punching on prepared cards. The speed of the IBM machine in positioning and punching cards is the limiting factor in translator speed.

These Items Recorded

Individual survey information requirements determine selection of a suitable card. One representative card has been designed, and the translator tape speeds are chosen accordingly. The available card accommodates these data:

1. Eight 15-min interval totals (four columns per interval to permit use of the same card for totaling).
2. Year.
3. Month.
4. Date.
5. Day of the week.
6. Period of day (1 through 6 for six cards per day).
7. Survey number.
8. Customer identification.
9. Demand constant.
10. Three spare columns for other identification.
11. Eight 15-min interval totals.

Six Cards Per Day Needed

This card accommodates 16 interval totals. Thus six cards per day are needed when 15-min intervals are used. These six cards are identified by the period of the day, each day being divided into six periods of 4 hr each, beginning at midnight.

IBM cards have 80 columns of information, and 12 positions in each column. A 30-day tape punched out on a 15-min interval basis requires 180 cards bearing a total of 2,880 demand readings.

A control unit has been developed for pre-punching 180 cards. A separate unit, it is connected to the IBM machine when needed. Data are key punched on the first card, and the control unit is then set for the time interval, day, etc. The other cards are punched automatically, 30 per min, to build up the necessary card deck for receiving the translator "read-out" of survey data.

(*More How To on page* 138)

G-E Engineers Measure "Scram" Speeds to 1/1000th of a Second

To determine nuclear reactor control element and mechanism operating characteristics during the design stage, General Electric engineers use this versatile test loop which simulates actual reactor conditions. In-service scram speeds, release times, reliability under adverse conditions, and mechanism life can be ascertained *before* the control drive is specified for a particular reactor.

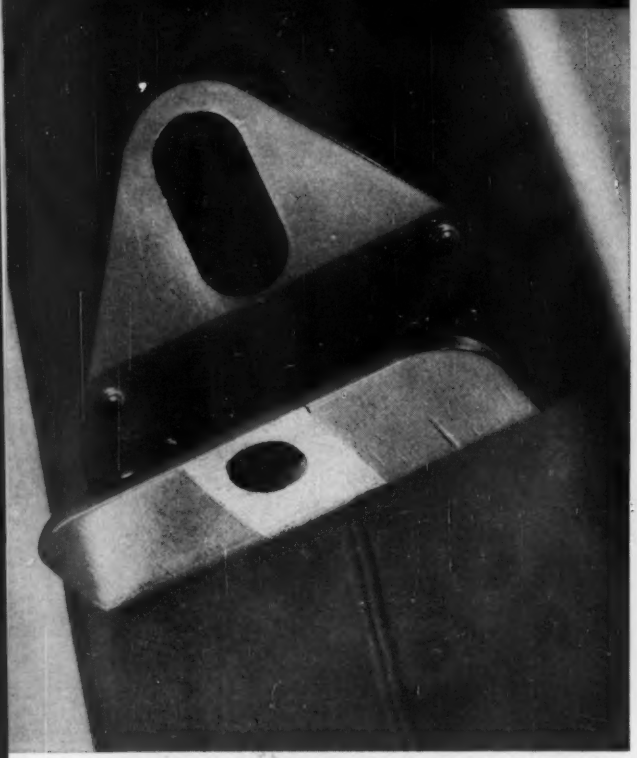
Determining critical operating characteristics like these in the design stage, is another example of General Electric engineering leadership in the field of atomic energy.

Atomic Power Equipment Department, General Electric Company, Schenectady 5, New York. 156-3

Progress Is Our Most Important Product

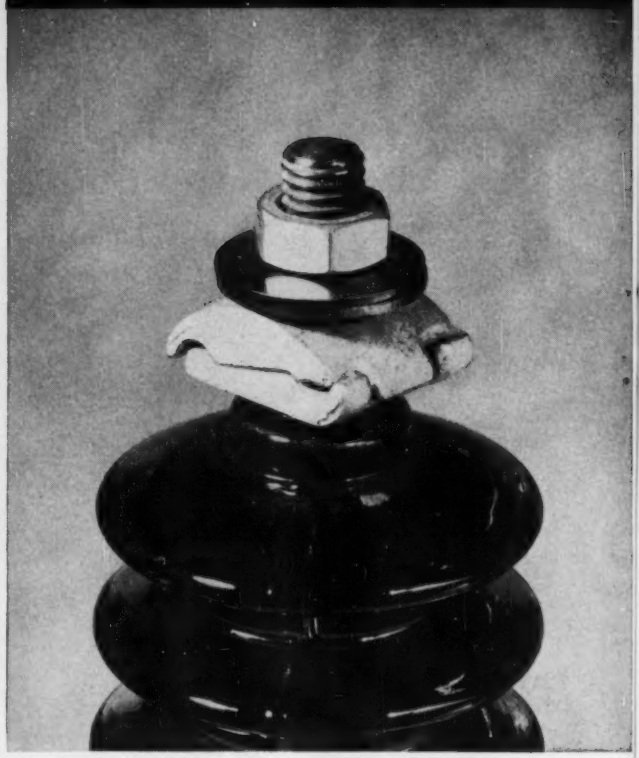
GENERAL ELECTRIC

1 POSITIVE GROUND



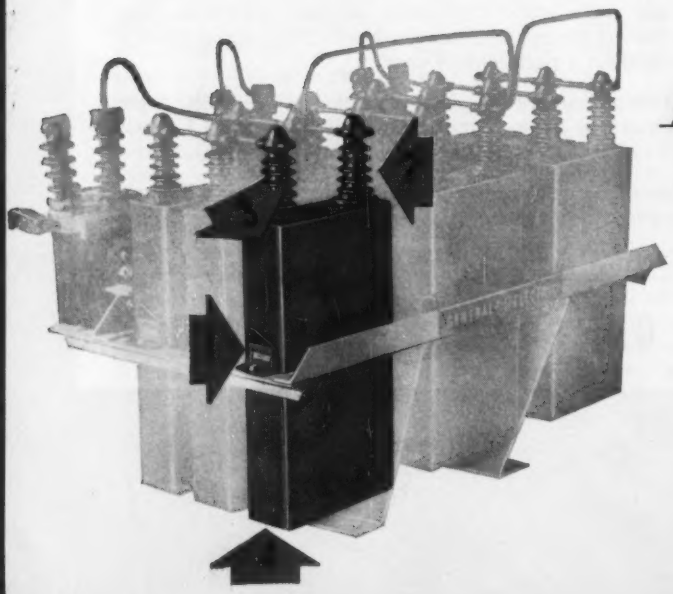
Permanent grounding is assured through an unpainted area on the bottom of the mounting bracket. Each capacitor bracket is welded to the case at eight points to provide maximum strength for hoisting and mounting.

2 PERMANENT CONNECTION



This new bushing and terminal assembly combines excellent electrical and mechanical characteristics. It accommodates aluminum or copper conductors in a 1000-lb. grip that compensates for cold flow.

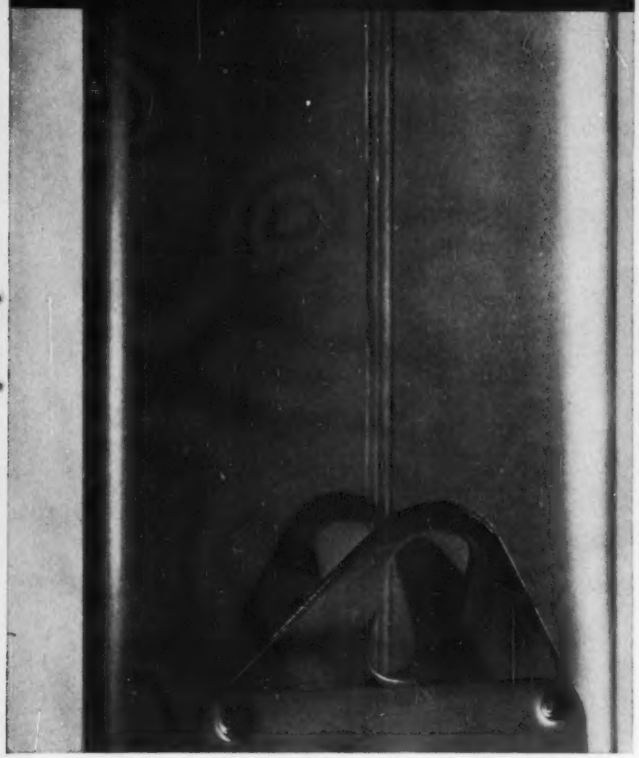
Four capacitor features



Engineered Extras

● **of General Electric's 50-kvar capacitor make this unit and the equipments in which it is used the most efficient and economical source of kilovars available today—further evidence of General Electric's efforts to give you the most for your capacitor investment.**

3 PRECISION WELD



The case of each new General Electric 50-kvar capacitor is automatically welded to provide a seam of controlled quality and uniform strength. In fact, this precision welded, hermetic seal is as strong as the case itself.

4 RECESSED BOTTOM

Recessed bottoms reduce scraping of the protective coating during warehousing and installation. This construction also prevents rain drops from collecting on the bottom of the capacitor and corroding the case.

that make a difference

The new General Electric 50-kvar capacitor—first of its rating in the industry—gives you these important Engineered Extras along with:

Less Weight Per kvar. One 50-kvar capacitor weighs 15% less than two 25-kvar capacitors. In switched equipments this provides an even greater weight saving—up to 25%.

Lower Cost Per kvar. One 50-kvar capacitor costs 10% less than two 25-kvar units. In switched equipments costs can be reduced even more—up to 25%—since a 600-kvar equipment needs no more switches than a 300-kvar equipment.

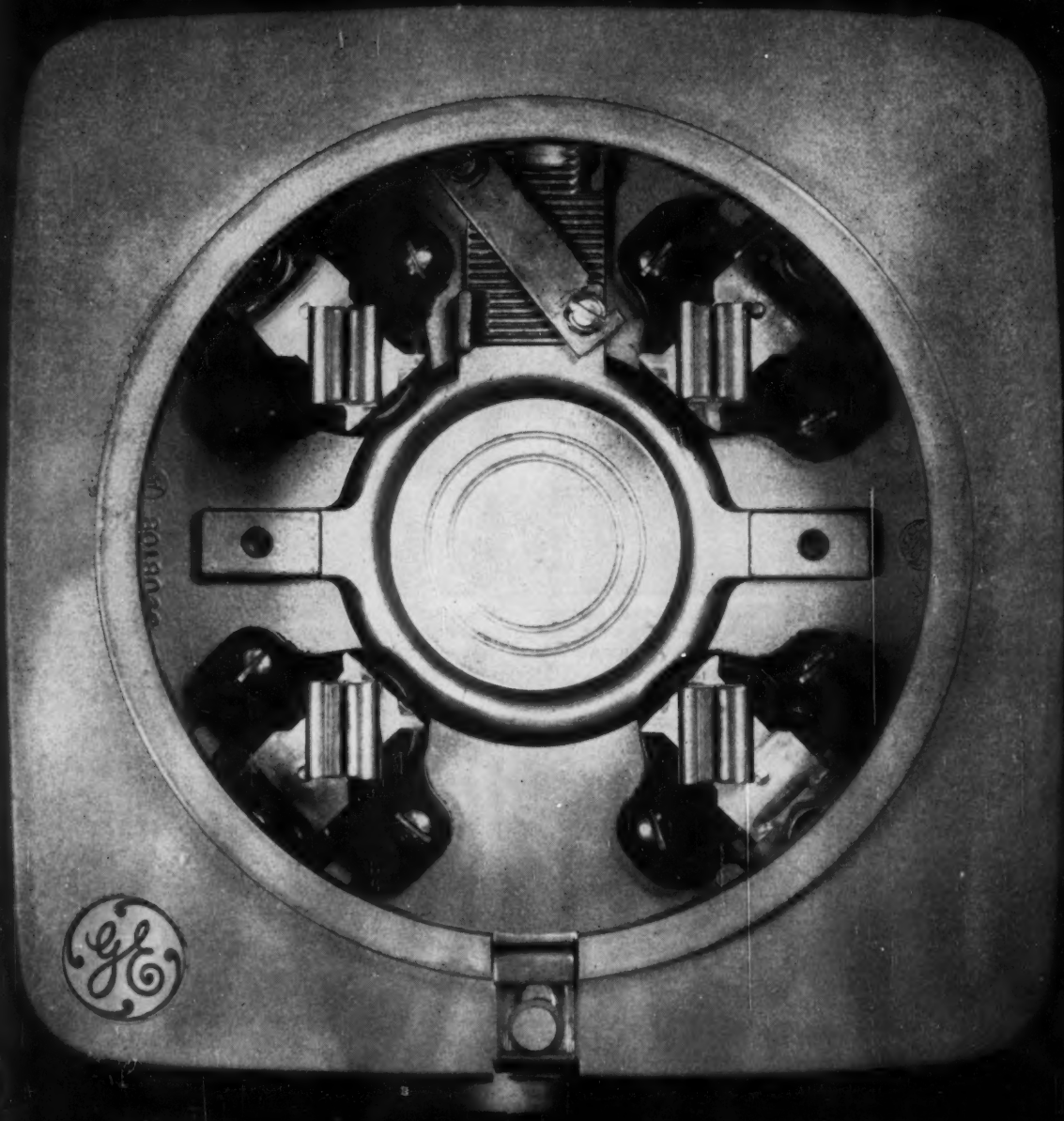
Because of General Electric's intensive capacitor research, capacitors have been continuously reduced in price. Today, the 50-kvar capacitor costs only $3.82 per kvar, or 55% less per kvar than capacitors of 20 years ago. For complete information about them, contact your G-E Apparatus Sales Representative. General Electric Company, Schenectady 5, N. Y.

441-36

Progress Is Our Most Important Product

GENERAL ELECTRIC

NEW G-E Square Meter Socket

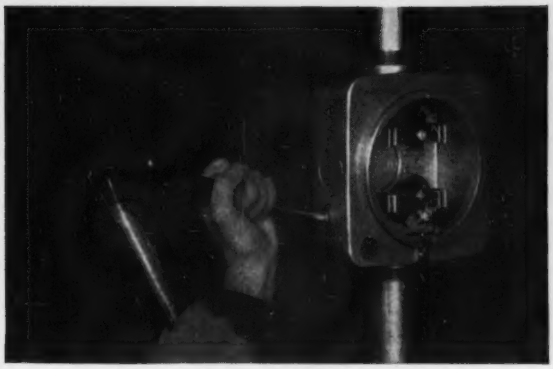


Progress Is Our Most Important Product

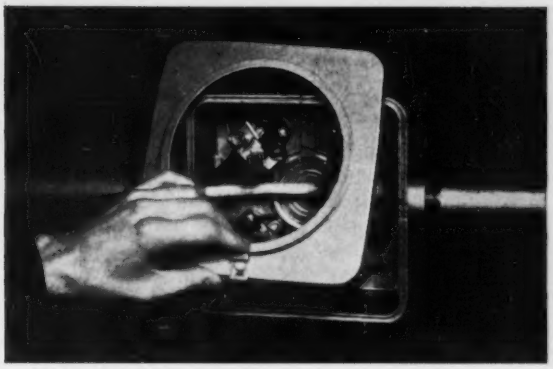
GENERAL ELECTRIC

for Installations Up to 100 Amps

offers you these important, money-saving benefits

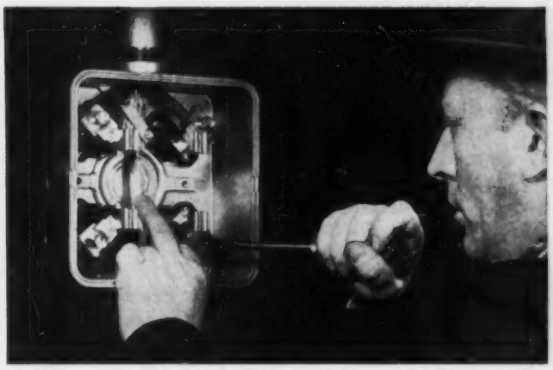


1. POSITIVE, ONE-WAY KNOCKOUTS—New pre-scoring arrangement on both inside and outside of socket assures perfect knockout every time. No prying or bending needed.

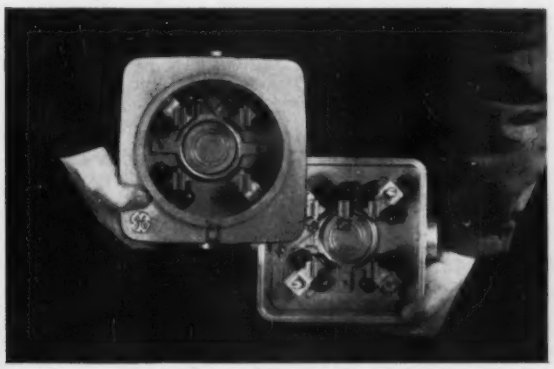


2. EASIER ACCESS—Unique snap-lock cover can be removed and replaced in seconds without any tools. Just flick the lock, lift the cover and socket is open and ready for wiring.

3. 100-AMP CAPACITY—Assures that today's installation will meet greater loads of future. New socket is perfect partner for General Electric's I-55 extended range meters.



4. EASIER, FASTER WIRING—a unique, modern design, plus lay-in type terminals requiring wiring bend of only 45 degrees speeds up and simplifies installation.



5. GREATER VERSATILITY—New G-E square meter socket can be mounted vertically or horizontally. Added flexibility is obtained by easy addition of fifth or sixth terminal.

6. A COMPLETE LINE—CT sockets, high-capacity, box-type, and round and square sockets for single-phase meters.

LIVE BETTER ELECTRICALLY

FOR MORE INFORMATION contact your nearby G-E Apparatus Sales Office or authorized distributor . . . or write for bulletin GEA-5878 to General Electric Company, Section 625-2, Schenectady 5, N. Y.

Guide to Switchgear Maintenance

A preventive maintenance program is outlined for medium-voltage, metal-clad type switchgear, and air-magnetic and oil-filled types of power circuit breakers. The outline lists benefits to be derived, records, tests and facilities required, and inspection and servicing steps

L. J. McELVARR, Engineer, Medium Voltage Switchgear Department, General Electric Co Philadelphia, Pa.

I—Maintenance Benefits and Facilities

Basic elements are outlined for a maintenance program of switchgear installations.

A. Benefits of a Maintenance Program

A well executed program has these benefits:

1. Longer life of switchgear and fewer replacements.

2. Reduced time on repairs and overhauls, and the option of scheduling them at an opportune time.

3. Fewer failures with unexpected outages.

4. Timely detection of any undesirable operating conditions which require correction.

5. Improved plant performance and increased operating economies.

B. Maintenance Records

A file should be established and include:

1. A record of all installed switchgear and its maintenance schedule.

2. Nameplate data of the equipment and its major components, instruction books, renewal parts bulletins and drawings.

3. A list of all items which have to be inspected and what adjustments are to be checked.

4. A record of past inspections and test results.

C. Maintenance Tests

Maintenance tests are applicable as indicated:

1. Insulation resistance tests of the breakers and of the switchgear bus can be useful in determining the condition of the insulation if they are made regularly. Since definite limits cannot be given for satisfactory insulation resistance, a record must be kept of the readings and comparisons made. Deterioration of insulation and the need for corrective action can be recognized if the instrument readings are progressively lower after each test.

2. High potential tests are not required and are not recommended except in special circumstances, such as after repairs or modifications to the equipment that included the primary circuit. When such tests are necessary, they may be made using 75% of the standard 60-cycle insulation test voltage for new equipment.

3. After the switchgear has been serviced and adjusted, its operation should be checked before it is returned to service. This can be best done by putting the breaker in the test position and operating it with its associated control and protective devices through the test couplers.

D. Maintenance Equipment

Adequate maintenance equipment should include:

1. Spare parts for at least those parts of the switchgear that are vital to continued operation. Manufacturer's recommended list of spare parts can be used as a guide in combination with operating experience to determine variety and quantity of parts to be stocked.

2. A well-lighted shop equipped with following:

- **a.** A test cabinet for air magnetic breakers or an inspection rack for oil circuit breakers.
- **b.** Maintenance closing device for power breakers.
- **c.** Test couplers for connecting breaker to control circuit when it is in the test position.
- **d.** Relay test plugs for making tripping, timing and calibration tests of relays.
- **e.** A selection of ammeters, voltmeters and instrument transformers.
- **f.** An insulation resistance tester.
- **g.** A portable oil tester for circuit breaker oil; also a filter press for reconditioning oil.

E. Frequency of Inspection

It is generally good practice to inspect equipment three to six months after it is first put in service and then inspect and maintain it every one to three years depending on its service and operating conditions. But this suggested schedule is only a guide. Conditions that can make more frequent maintenance necessary are: **1.** High humidity and ambient temperature, **2.** corrosive atmosphere, **3.** excessive dust and dirt, **4.** high repetitive duty, **5.** frequent interruption of faults, and **6.** older equipment.

F. Safety Practices Must Be Followed

Maintenance employees must follow all recognized safety practices, such as those contained in the National Electrical Safety Code and in company or other local safety regulations during maintenance. All of the units of switchgear to be maintained must be de-energized, grounded and tagged out before removing covers and barriers for access to primary circuits. As is well known, the solid insulation surrounding an energized conductor in power apparatus should not be relied upon to provide protection to personnel. Another example is the maintenance closing device, which is exactly what the name implies and should never be used to close manually a circuit breaker that is connected to an energized circuit. All removable devices, such as the circuit breakers and rollout potential transformers, should be removed from the metal-clad switchgear housing.

II—Maintenance Program for Switchgear

The maintenance program should include the thorough inspection, servicing and adjustment of the following components for 2.4 - 13.8 kv operating service.

1. Metal-clad Stationary Units

- **a.** Remove accumulated dust and dirt. Vacuum cleaning is recommended.

b. Wipe insulated buses and bus supports with a clean cloth moistened (when necessary) with a petroleum solvent or similar cleaner. Wipe insulation dry after cleaning.

c. Inspect buses and connection bars for physical damage, evidence of corona or other conditions that can indicate deterioration of the insulation.

d. Lubricate moving parts of elevating mechanism with a non-hardening grease.

e. Inspect alignment and contacting of primary disconnecting devices, checking for signs of abnormal wear or other damage. Note: Discoloration of the silvered surfaces is not usually harmful unless caused by sulphide deposits which can be removed by a solvent, such as alcohol, or by silver polish.

f. Check adjustments and operation of safety shutters, interlocks, auxiliary and limit switches.

g. Inspect all relays, contactors, switches, fuses and other devices for correct operation.

h. Check tightness of anchor bolts and structure bolts, also control connections and continuity of wiring.

j. Check strip heaters and clean air filters at ventilation openings when these are present.

k. Repair damaged paint finishes.

2. Power Circuit Breakers (Air Magnetic Type)

Air magnetic type circuit breakers should be maintained on the same schedule as the metal-clad units or every 2,000 operations, whichever comes first. It is also recommended that when the normal operating duty is a combination of fault interruptions and repetitive operations, the breaker should be inspected and serviced after a fault operation at or near its interrupting rating. After the breaker should be removed from its housing.

a. Wipe insulating parts, including bushings and the inside of box barriers, clean of smoke and dust. Repair moderate damage to bushing insulation by sanding smooth and refinishing with a clear insulating varnish.

b. Inspect alignment and condition of movable and stationary contacts. Check their adjustment as described in the instruction book.

c. Check arc chutes for evidence of damage, and replace damaged parts. When arc chutes are removed, blow out dust and loose particles.

d. Clean silver-plated breaker primary disconnecting devices (see **le**). Whether cleaned or not, lubricate devices by applying a thin film of slow aging, heat resistant grease.

e. Inspect breaker operating mechanism for loose hardware and missing or broken cotter pins, retaining rings, etc. Examine cam, latch and roller surfaces for damage or excessive wear.

f. Clean and relubricate operating mechanism. Use light machine oil (SAE-20 or 30) to lubricate pins and bearings not disassembled. Use a non-hardening grease to lubricate the ground or polished surfaces of cams, rollers, latches and props, and of pins and bearings that are removed for cleaning.

g. Check breaker operating mechanism adjustments and readjust as described in the instruction book. If these adjustments cannot be made within specified tolerances, it will usually indicate excessive wear and need for a complete overhaul.

h. Check control device for freedom of operation. Replace contacts when badly worn or burned.

j. Inspect breaker control wiring for tightness of connections.

k. After the breaker has been serviced, operate it slowly with closing device to check absence of binding or friction and check that contacts move to the fully opened and fully closed positions. Check electrical operation using either the test cabinet or test couplers.

3. Power Circuit Breakers (Oil-Filled Type)

Oil circuit breakers should be inspected and maintained on the same schedule as the air magnetic type of power circuit breaker as outlined in Section 2 or more frequently, if needed, to insure maintaining the proper dielectric strength of the oil.

To inspect an oil circuit breaker, elevate it on the inspection rack and untank it to expose breaker contacts.

a. Check condition, alignment and adjustment of contacts to insure that contact surfaces bear with firm, uniform pressure. Use a fine file to dress rough contacts; replace pitted or burned contacts.

b. Wipe clean all parts normally immersed in oil to remove traces of carbon that remain after the oil has drained. Inspect insulating parts for cracks, warpage or other damage requiring replacement.

c. Test dielectric strength of the oil, using a 0.1-in. gap with 1.0-in. dia disk terminals, and if less than 22 kv, remove and filter or replace with new oil having a dielectric strength of at least 26 kv. Filter oil whenever visual inspection shows an excessive amount of carbon, even if its dielectric strength is satisfactory, because the carbon will deposit on insulating surfaces decreasing the insulation strength.

Note: *Oil samples should be taken in large-mouthed glass bottle that has been cleaned and dried with benzine. A cork stopper should be used with this bottle. Test samples should be drawn from the bottom of the tank after the oil has had time to settle and should represent oil from the tank proper and not what has been lying in the valve or drain pipe.*

d. Periodically remove the oil from the tank; and wipe the inside of the tank, the tank linings and barriers to remove carbon that has adhered.

e. Inspect breaker and operating mechanisms for loose hardware and missing or broken cotter pins, retaining rings, etc.

f. Check adjustments and readjust when necessary as described in the instruction book.

g. Clean operating mechanism and relubricate similarly as for air magnetic type breakers (see 2f).

h. Before replacing the tank, operate breaker slowly with maintenance closing device to be sure there is no friction or binding that will prevent or slow down its operation. Then check the electrical operation.

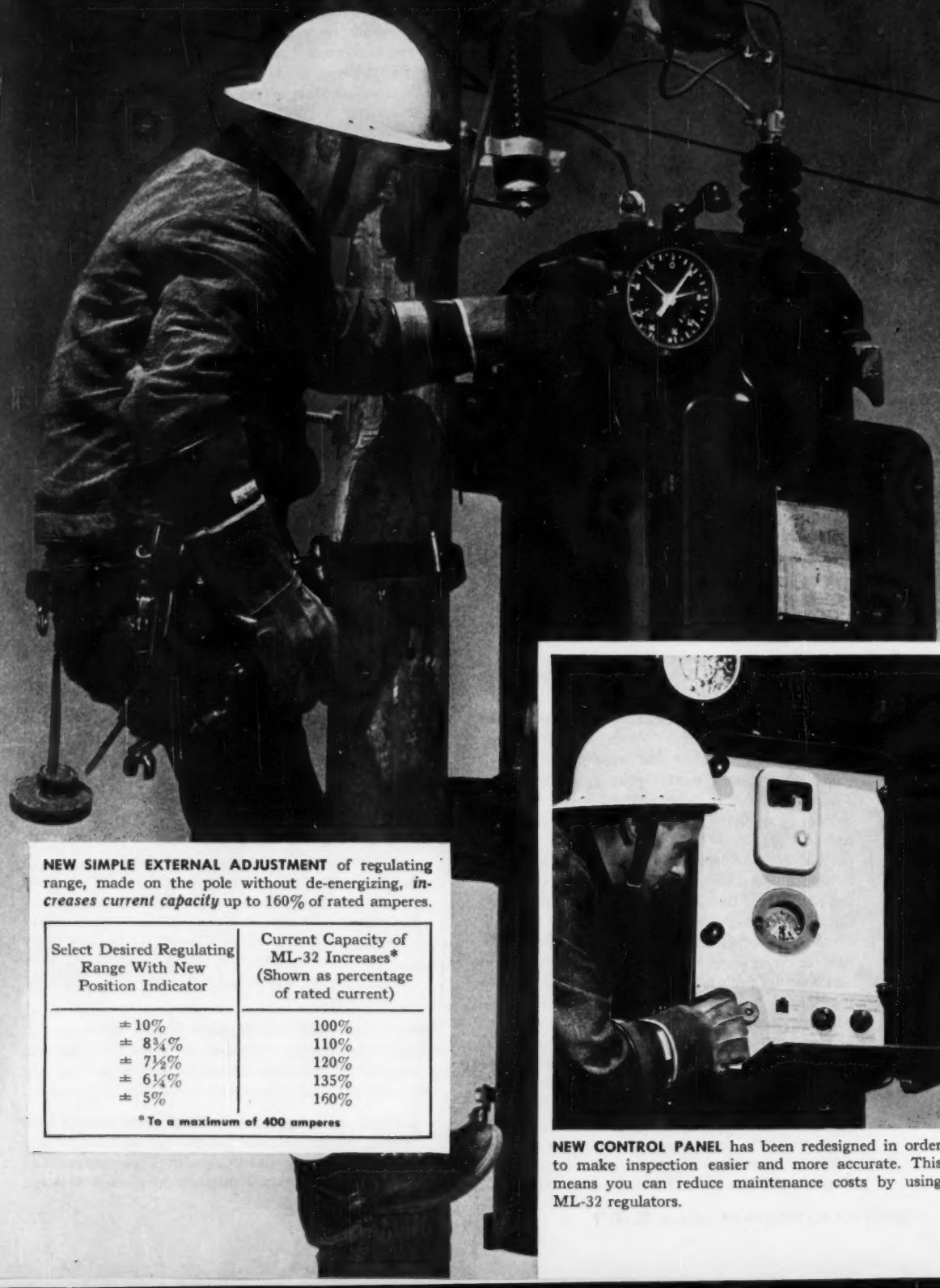
Note: *Avoid operating the breaker any more than is necessary when testing it without oil in the tank, because it is designed to operate in oil and mechanical damage can result from execessive operation without it.*

j. When replacing the tank, filled to the correct level with oil, be sure the gaskets are undamaged and the tank nuts and flange nuts on gauges and valves are tightened properly to prevent leakage.

VOLTAGE REGULATORS

PROFITABLE VOLTAGE REGULATION

to help solve your distribution problems



NEW SIMPLE EXTERNAL ADJUSTMENT of regulating range, made on the pole without de-energizing, ***increases current capacity*** up to 160% of rated amperes.

Select Desired Regulating Range With New Position Indicator	Current Capacity of ML-32 Increases* (Shown as percentage of rated current)
± 10%	100%
± 8¾%	110%
± 7½%	120%
± 6¼%	135%
± 5%	160%

*To a maximum of 400 amperes

NEW CONTROL PANEL has been redesigned in order to make inspection easier and more accurate. This means you can reduce maintenance costs by using ML-32 regulators.

With NEW G-E LOAD BONUS POSITION INDICATOR you can now

INCREASE CAPACITY WITH REGULATOR ENERGIZED

NEW LOAD BONUS switch located in the position indicator of the redesigned General Electric ML-32 step voltage regulator now permits simple, one-man, on-the-pole adjustment of current capacity and regulating range *without de-energizing* the regulator. With "raise" and "lower" settings independently adjustable, current capacity up to 160% of normal at ±5% regulation is available up to 400 ampere maximum. *Load Bonus is now standard equipment on all G-E pole and station-type single-phase step regulators.*

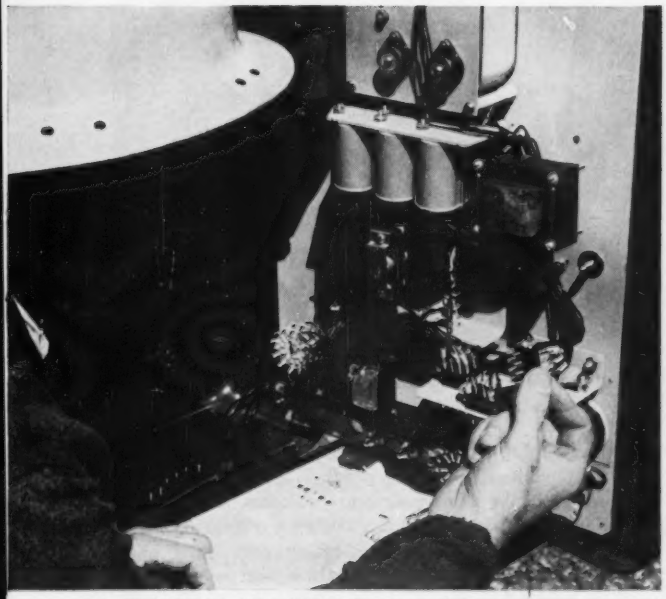
OTHER NEW FEATURES that mean increased dependability, accuracy, and economy include quickly interchangeable plug-in control components; internal channel design for easier, safer untanking by one man; and a larger, clearer tap-position indicator for improved visibility. These features, shown in detail on these pages, make this the most advanced step regulator on the market today.

UP TO 50% SAVING in first cost, compared with all other types of feeder or station regulating equipment, is an additional benefit of the new G-E ML-32 step regulator. A complete line is available —25 to 167 kva and in five voltage classes.

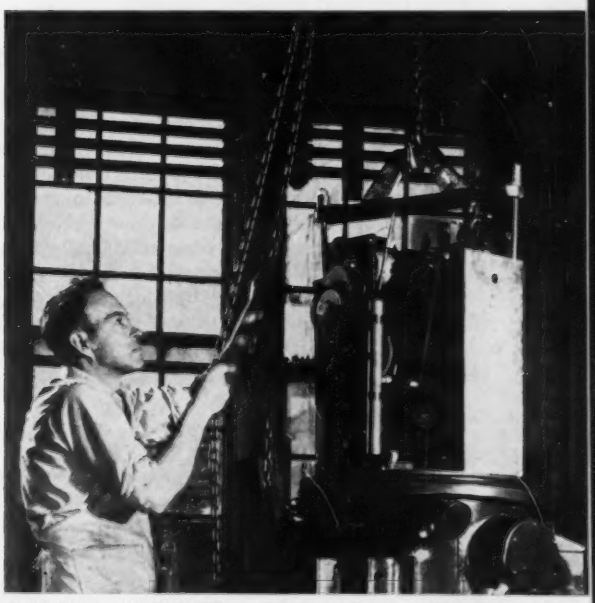
COMPLETE INFORMATION is contained in a new bulletin, GEA-5752. For your copy, contact your G-E Apparatus Sales Representative, or write to General Electric Company, Section 423-14, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC



NEW PLUG-IN COMPONENTS mean faster, more economical maintenance. Voltage-regulating relay, line-drop compensator, time-delay relay, and the control panel itself all have quickly removable plug-in connectors.



NEW EASY UNTANKING speeds maintenance. Entire regulator is a one-piece assembly mounted between protective supporting channels. Lifting eyes at top of channels allow quick, safe removal by one man.

Pre-Assembling Switches Cuts Outage, Labor

E. H. BRAID, Trans. & Distr. Supvr., and **J. F. MELTON**, District Engrg. Supvr., Appalachian Electric Power Co, Charleston, W. Va.

When sectionalizing facilities were found necessary at a tap-off from the 44-kv loop line to a mine, Appalachian Electric Power Co reduced outage time and labor costs by pre-assemblying the sectionalizing switches on the ground. The sectionalizing switches were pre-assembled on their permanent frame which was temporarily supported at the base of the line poles. The assembled switches were then hoisted to the top of the poles, and the mechanical and electrical attachments were made.

Hot-line work could practically eliminate outages but would substantially increase labor costs. Installation of gang-operated air-break switches on a single pole adjacent to existing structures would have required only one outage and might have been cheaper.

Heretofore such an installation had these steps:

1. Install a temporary by-pass line.

2. Remove all energized conductors from the proposed sectionalizing structure so that the switches could be safely installed.

3. Install the switches and connect wires.

4. Close sectionalizing switch, remove by-pass line.

By pre-assembling the sectionalizing switches, the two service interruptions involved in Steps 1 and 4 were avoided. With only a single interruption, the final step—making of the mechanical and electrical attachments—was accomplished by the following procedure:

1. Clearance was obtained, and protective grounds were placed on the 44-kv and 2.4-kv circuits.

2. All conductor attachments were removed from the structure and "tied-off" as necessary, and all crossarms and other material no longer needed were removed.

3. Pole-top gins were installed and the assembled switch was raised to the top of the structure and bolted in place.

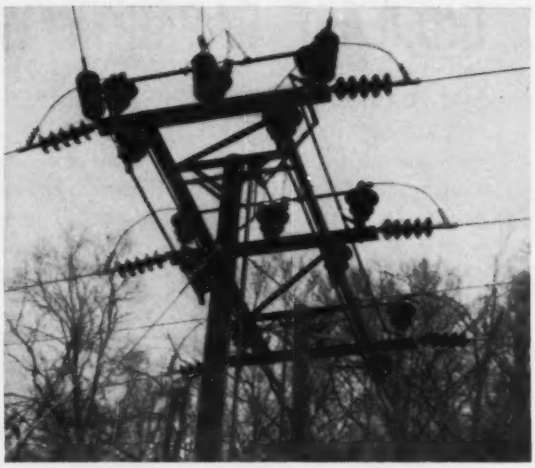
4. The 44-kv conductors were connected to the switch, and the 2.4-kv circuit was returned to its original position.

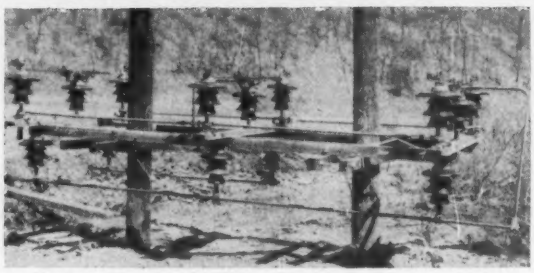
5. Operating mechanism was attached to the switch, and all adjustments were checked.

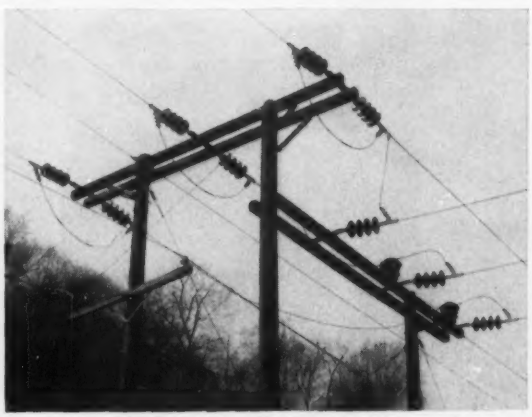
6. Protective grounds were removed, and all conductors on the structure were re-energized.

Although reduction of interruption time was the chief objective, this procedure also reduced labor expense nearly 24%. Excluding equipment and material expense, relative labor costs were as shown below:

	Method	
	Old	**Pre-Assembled**
Fabricating steel and transportation to site	$104.65	$104.65
Temporary Line	265.00	———
Assembling, erecting, wiring and removal of one pole and equipment	965.81	915.81
Total Labor Cost	**$1,335.46**	**$1,020.46**





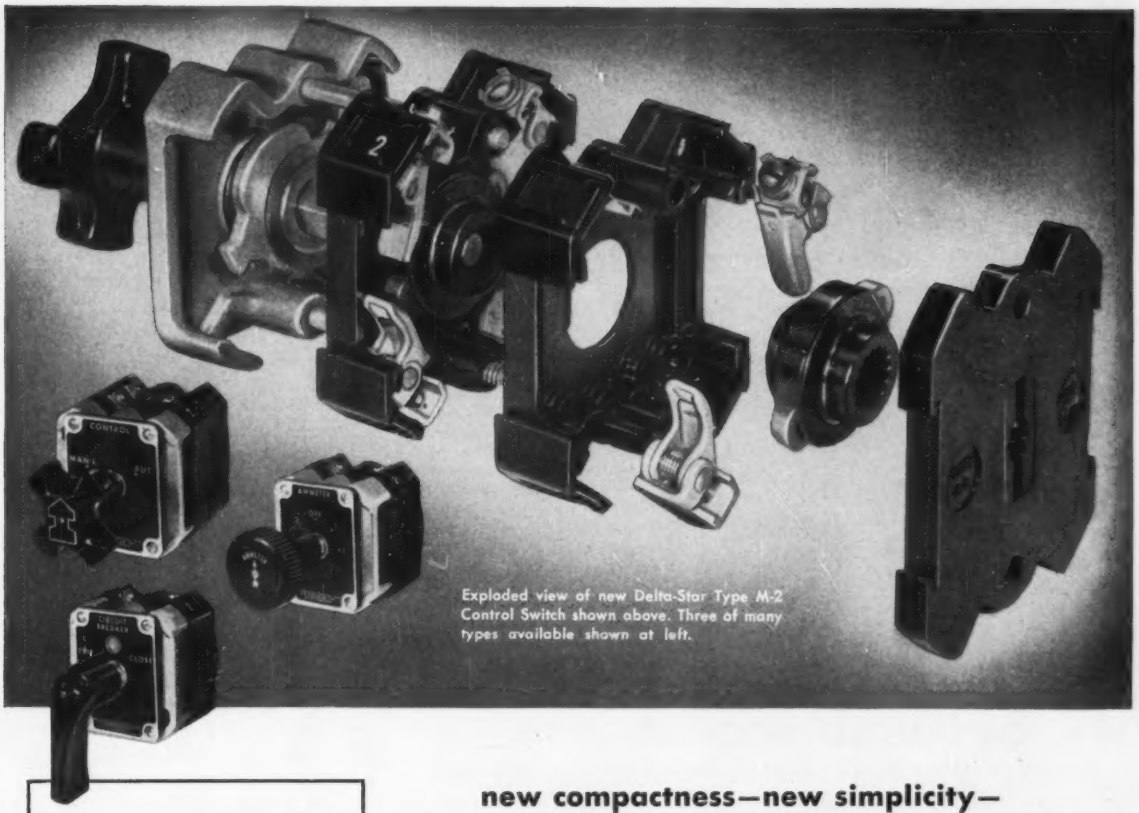


In describing this outage-saving procedure, the method, not the type of sectionalizing switch, is the important thing. While use of the tandem air-break switches, as illustrated, may be questioned, this switch has an arc-breaking ability and general performance comparable with other gang-operated switches on the Appalachian system over 20 years.

(*More How To on page* 140)

ANNOUNCING...

Completely new, highly versatile Delta-Star Control Switches



Exploded view of new Delta-Star Type M-2 Control Switch shown above. Three of many types available shown at left.

Many types available including . . .

- Circuit Breaker Control
- Motor Control
- General Control
- Manual to Automatic Selector
- Ammeter Switches
- Voltmeter Switches
- Power Factor Meter
- Wattmeter
- Frequency Meter
- Regular Transfer
- Temperature Meter
- Synchroscope

new compactness—new simplicity—new ruggedness—new interrupting capacity

Look, inspect and double-check—you'll see why Delta-Star's new Control Switches offer new features that mean vastly improved efficiency, economy and service:

1. **Versatile**—available for many uses; switches are rated 20 amps. continuous rating with 250 amp. short-time (3-second) rating.
2. **Compact**—only 3¾ in. high by 3¼ in. wide; new design permits easy wiring and quick inspection.
3. **Rugged and long-lasting**—combining heavy duty parts with customary Delta-Star quality construction.
4. **High interrupting capacity**—large terminal clearances and complete baffling between sections. At 250 volts a.c. on inductive circuits, single break contacts are rated 25 amperes, double break contacts 75 amperes.

Now Delta-Star offers *premium* control switches at *regular* prices. Check them without delay—write or ask for Type M-2 Control Switch Price List 72-D4.

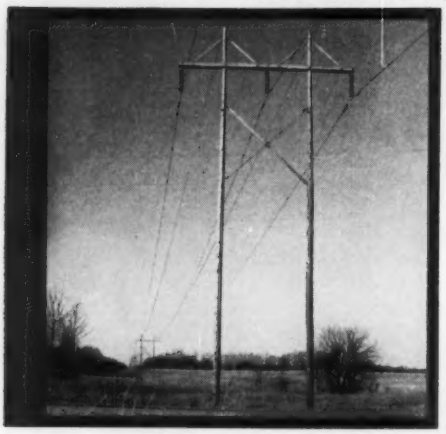
DELTA-STAR ELECTRIC DIVISION

H. K. PORTER COMPANY, INC.

2437 Fulton Street · Chicago 12, Illinois

District Offices in Principal Cities

GALVANIZED STEEL STRAND

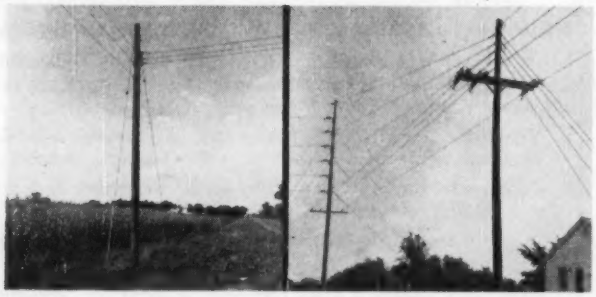


YOUR ASSURANCE OF HIGH QUALITY, LONG LIFE AND LOW COST

Close laboratory control over each step in manufacture has established Crapo Galvanized Steel Strand as a product of highest quality and dependability. You benefit through longer service life and lower ultimate costs.

Heavy, uniform, tightly-bonded coatings of commercially pure zinc, applied by the famous Crapo methods, withstand the punishment of construction, provide maximum resistance to corrosion and contribute to over-all economies.

For OVERHEAD GROUND WIRE . . .
CRAPO Weldless Galvanized Steel Strand



The most practical and economical strand for shielding transmission lines against lightning. Maximum strength and high fatigue endurance, inherent in Crapo Weldless Strand, provide that extra safety factor so important in overhead ground or static wire.

For GUYS and MESSENGER . . .
Crapo Galvanized Steel Strand. Made to highest standard specifications . . . a size and breaking strength to meet all practical needs.

Contact your jobber or write for descriptive folder.

INDIANA STEEL & WIRE CO., INC.
Muncie, Indiana

DISTRIBUTION—Maintenance

Rebuilding Coupling Capacitors Saves

E. W. MEADOR, M. M. BOSTIAN, and **R. C. CRUISE,** Appalachian Electric Power Co, Bluefield, W. Va.

Rebuilding coupling capacitors whose rings have cracked has proved to be practicable and economical for Appalachian Electric Power Co when the capacitors' condition has been discovered before moisture has damaged the inside parts.

The savings, based on the price of new 88-kv couplers, range from $450 to $800 for three units compared with junking old or damaged units and replacing them with new ones. Only time will tell, however, whether the bronze rings replacing the original aluminum-alloy rings will crack or give trouble. Meanwhile they are expected to give better service than the old ones.

Rings Cracked

Considerable trouble had been experienced by the company for more than two years with some coupling capacitors used on 33, 88, and 132-kv circuits for relaying and communication purposes. The aluminum-alloy rings cracked, apparently because of vibration of the metal, internal stresses, fatigue, or metal crystallization. Internal parts were undamaged.

Immediate replacement or rebuilding was necessary. Initially the company had hoped to rebuild the units by welding the cracked rings and recementing them to the bushings, the cost of new coupling capacitors being as high as $600 to $900 apiece for 88-kv service. Efforts to weld the aluminum alloy failed. The company found a number of casting imperfections in the rings.

Rings Cast Locally

As new rings could not be furnished by the manufacturer, they were cast from bronze metal by a local foundry using the old rings as patterns. These were cemented to the coupler porcelain, using the same procedure used with transformer and OCB bushings. A stiff grout of one part portland cement and two parts fine sand with sufficient water to give a stiff putty-like consistency is used. This is mixed in

(Continued on page 145)

THIS

never happened on my lines

. . . or did it?

At an impulse wave front of 8,000,000 volts per microsecond, twice the estimated steepness of wave front of lightning, this string of insulators with experimental shields is in fractional-microsecond pre-flashover corona. This condition occurs about 1/100 millionth of a second before flashover; the time when insulators undergo maximum applied voltage duty.

Advanced research into fractional microsecond pre-flashover lightning corona is the latest contribution of O-B Technical Competence

It's a strange looking picture of a string of insulators!

Part of the strangeness comes from its novelty. This is what an insulator string looks like 1/100 millionth of a second before lightning flashover. This is the instant of supreme electrical stress. For the first time, it has been brought under a course of organized technical study in the O-B High Voltage Laboratory.

Would such an event be likely to happen on an ordinary transmission line? Statistics tell us that in an average storm territory (30 annual storm days) lightning will strike lines at a rate of one stroke per mile, per year. Consequently this has a very good chance of appearing on any power system, perhaps several times in a single summer.

See the next two pages for more information on this valuable and extremely interesting research.

OHIO BRASS COMPANY, MANSFIELD, OHIO
In Canada—Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

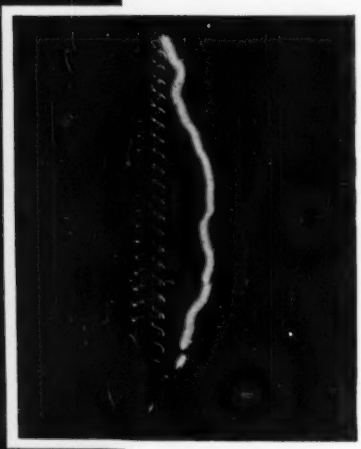
TECHNICAL COMPETENCE the heart of every Ohio Brass insulator

How we keep a

New in design . . .

Ultra steep impulse wave fronts, being the destructive and troublesome components of natural lightning, are tremendously important factors in the progress of insulator development. Production of test waves steeper than natural lightning, however, is a new art. Their behavior and effects are unorthodox and are still objects of intensive study. Their measurement is complex. Even their observation in the vital fractional microsecond pre-flashover corona phase is beyond human visual capacity. Months—perhaps years—of testing and correlation lie ahead before techniques and findings will become a part of regular laboratory working data.

This research into new and unexplored areas of electrical time imposes severe demands on both facilities and man-power. We are not required by any set of National manufacturing standards to probe these advanced technical frontiers. This laboratory, and its skilled personnel, are here by the choice of farsighted management—that choice being to anticipate rather than follow the requirements of the electrical industry, and to be ready, today, with tomorrow's products that will stay *new* longer; new in design, new in service potential.



Complete string flashover at a wave front of 8,000,000 volts per microsecond. It is a significant part of this ultra steep front impulse discharge that the arc hugs tightly to all insulator surfaces—even following contours of the petticoats on the lower surfaces (note form of arc). This is evidenced by marking of the glaze by the heavy discharge. For comparison, the small inset shows a 1½ x 40 microsecond impulse discharge near critical flashover with its conventional tendency to jump clear of the insulators. This latter has, for years, been accepted as a testing standard. The pictures tell more than words how much more "vicious" is our new type of test.

product NEW for you...longer...

new in service potential

In addition to the experimental upper ring shown on the first page, fractional microsecond pre-flashover corona was observed on a more conventional insulator arrangement. Here, a plain string and one equipped with our present commercial design of shield ring at the conductor are subjected to similar suppressed impulse discharges. Note how the ring relieves corona in the conductor and clamp zone. It is also interesting to observe the almost random occurrence of single-unit flashover on the insulators. These photographs were made at a wave front of 8,000,000 volts per microsecond rise, at a time *within* 1/100 millionth of a second before actual flashover. In no case did full flashover occur, due to the use of a critically adjusted chopping circuit.

A Little of the story . . .

Some explanation was urgently sought. Lines being built as part of the country's 330-kv network were showing lightning outages in excess of design expectation, and out of all relation to past experience, both as to location of insulator flashovers and frequency of occurrence. Yet, according to existing knowledge, they were built to the finest standards. Tower height was the only new major element. What factor might this be introducing?

Months of research in the O-B High Voltage Laboratory finally revealed a reasonable explanation for this problem and provided a basis for much further study. Present findings have been outlined in a recent AIEE paper.*

Basically, this is an extremely steep wave voltage phenomenon occurring at or near the point where lightning strikes a transmission tower. Production of such wave forms; their control, measurement, recording, and observation, have carried us far out on the frontier of new research. We have had to write our own textbooks as we go!

Since the human eye sees practically nothing in the study of fractional microsecond lightning corona that forms and evolves into flashover in about 1/100 millionth of a second, the camera was employed to record the field that exists in this inconceivably brief instant. The results were somewhat surprising. We show a few samples here.

Test voltage is applied to the top end of the insulator string because, when lightning strikes a tower, the tower top is elevated in voltage relative to the conductor during the travel time of the lightning wave down the tower, and its reflection back to the tower top. These fractional microsecond voltages appear and disappear long before the lightning surge has reached its current crest and, therefore, long before total tower voltage decreases to a value established by the crest lightning current multiplied by tower footing resistance.

*AIEE Paper 56-201, "Anomalous Flashovers on Transmission Lines" by C. J. Miller, Jr., Ohio Brass Co. Presented before Winter General Meeting, New York, Jan. 30-Feb. 3, 1956. Copies available on request to Ohio Brass Company.

the heart of every Ohio Brass insulator

COVERED by a decade of dirt...

. . . and 3 decades of research

Part of the contamination exposure area adjoining the O-B High Voltage Laboratory. Another space, equally large, is devoted to regular and experimental pintype, post, and station insulators. Each test specimen is energized. Each is connected to its own set of laboratory instruments that evaluate and record amplitude and frequency of leakage surges. Slowly but surely, these insulators are writing an authentic history of contamination leakage phenomena. And with equal sureness, they are helping to guide today's and tomorrow's O-B insulator designs.

Do you want to study industrial contamination of insulators? Come to the O-B High Voltage Laboratory—we've got plenty of it! This, in fact, is one of our prize "facilities."

Going back some 20 years, we began taking advantage of our fouled-up industrial surroundings. Test samples were put on exposure racks and watched for their behavior. In the ensuing 10 years, our basic understanding of leakage current phenomena improved greatly and led to a much more refined test set-up, including individual automatic measuring equipment on every specimen. This permits detailed investigation of the nature and action of leakage currents—the end-product of contamination. This thorough piece of research, in its present highly organized condition, is now 10 years old. By a fully controlled laboratory study of *natural* conditions, we get *the facts!*

This long-time technical project moves us back into an earlier period of electrical manufacture, when competent laboratories were even more scarce than today. Going back 20 years to the beginning of this investigation, however, the O-B laboratory was then nearly 10 years old.

This background of some 30 years of capable, organized research has certainly been one of the larger factors in O-B's unmatched performance records, and in the steady, solid product improvements that have been imparted by Technical Competence, the heart of every O-B insulator.

OHIO BRASS COMPANY, MANSFIELD, OHIO
In Canada—Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

4657-H

TECHNICAL COMPETENCE the heart of every Ohio Brass insulator

Capacitors Rebuilt

(*Continued from page* 140)

small batches so it will be used before initial set occurs. The cemented joint is submerged in water four days to age, then removed and air-dried for three days.

Although the manufacturer believed the undertaking impractical, a number of coupling capacitors with the new rings were returned to service and found satisfactory. In a few instances where only one ring was replaced, the second ring cracked after a few months, indicating that a time element was involved.

Both Rings Replaced

This led to replacement of both rings on each unit, even when only one had cracked. The first units on which bronze rings were substituted for the old aluminum-alloy rings have been in service more than three years without giving trouble.

Average cost of rebuilding a single unit, which does not vary with voltage rating, is approximately $50, of which $35 goes for labor and $15 for the two rings. Although any ring can be duplicated at the foundry in a reasonably short time, three different-size rings were cast and a few are kept in maintenance stock.

Procedure Followed

In rebuilding, the company follows this procedure:

1. Coupling is opened, and capacitor element is removed and submerged in clean dry oil until replaced.

2. Both rings are sawed off and the porcelain examined for cracks.

3. If no cracks are found and no large chips are broken off the flat surface of the porcelain, a bronze ring is cemented on one end. The cement is allowed to age about one week. Name plate from the old ring is transferred to the new ring before installation.

4. The second ring is applied and cement allowed to age the same time.

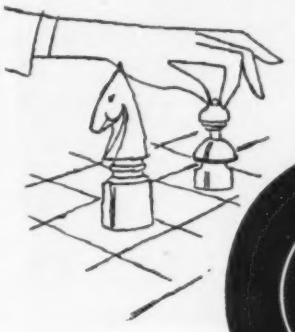
5. After the cement is allowed to dry three or four days longer, the capacitor is inserted in the porcelain, proper oil added, and the top bolted on.

6. Reassembled coupling capacitor is heated in an oven to 40C for 12 hr, the last hour under full vacuum.

7. Without venting the capacitor to attmosphere, it is filled with dry nitrogen gas at 10 psi and sealed.

(*Continued on page* 146)

Flexible, fast and safe, Coles mobile cranes can do more jobs better for less



Coles works closer to stacks for accurate spotting. maximum SELECTIVITY

COLES CRANES

JOLIET 6, ILLINOIS

Write for booklet "101 cost-cutting ways."

Photo courtesy Iowa-Illinois Gas & Electric Co.

Now, available L.P.G.- diesel- or gasoline-electric powered in capacities from 2 to 15 tons. Available on long term lease arrangement, too.

BIDDLE *Instrument News*

IT TAKES ONLY ONE STRIKE

. . . to knock out important electrical equipment

The season for electrical storms will soon be with us again in many sections of the country. The insidious thing about lightning is that it strikes at your plant's power system. Nine-tenths of the industrial damage it causes is to vital electrical equipment—motors, generators, transformers—or to power house chimneys. But this damage is of small consequence compared to the loss of power and stoppage of production. To prevent such losses, ground connections on lightning rods and arresters must be kept in good condition.

Test Grounds Once a Year

Properly installed and grounded lightning arresters are the first line of defense in protecting important electrical equipment such as generators, switchboards and transformers from lightning damage. Similarly, factory stacks are less subject to damage if protected by lightning rods and conductors that permit the stroke to pass harmlessly to earth.

In spite of apparently good lightning rod or arrester protection, lightning frequently will cause severe damage if high ground resistance hampers its dissipation in the earth.

Experience has shown that ground resistance does not remain constant and that tests should be made at least once a year, and high ground resistance corrected.

"Megger" Method

This is the simplest, easiest, quickest and most accurate method of determining ground resistance, and should be used wherever possible. The "Megger"® Ground Tester is an instrument specially designed for this purpose.

By virtue of the Megger crossed-coil ohmmeter the Megger Ground Testers are *direct-reading* in ohms. The operator reads the resistance value from the deflection of a pointer over a scale, as simply and easily as reading a voltmeter. These results are secured with only *one set of connections*, in *one operation*, and *without any calculations*.

For measurements of ordinary ground resistance, two auxiliary or reference grounds are required; or, connection may be made to a water system or other metallic structure that is known or assumed to have zero resistance to earth. The ohmmeter then indicates the resistance to earth of the ground under test.

Resistance of Grounds Should Not Exceed 5 Ohms

If tests show the resistance to ground is over 5 ohms, the resistance should be reduced by connecting to underground water pipes, copper plates or driven rods.

Want Help on Grounding Problems?

Write for these bulletins:

Bulletin 25JW — A Manual on Ground Resistance Testing
Bulletin 25T2W — "Grounding Electric Circuits Effectively"
Bulletin 25T4W — "Grounding Principles and Practices as Applied to Industrial Plants" B-604

JAMES G. BIDDLE CO.

- ELECTRICAL TESTING INSTRUMENTS
- SPEED MEASURING INSTRUMENTS
- LABORATORY & SCIENTIFIC EQUIPMENT

1316 ARCH STREET
PHILADELPHIA 7, PA.

(*Continued from page* 145)

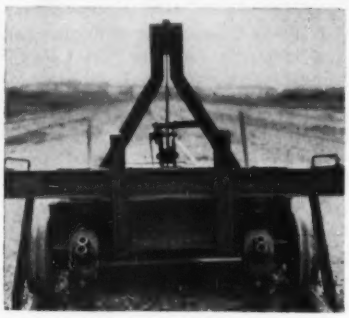
8. After cooling, the unit is checked with a capacitance bridge, and its rated voltage applied for about 1 min. If these tests are satisfactory, the unit is ready for service.

Power Plant Rail Track Leveled by Mobile Jack

R. R. REINSCH, Tennessee Valley Authority, Knoxville, Tenn.

Railroad track leveling around power plants has been speeded up through the use of a specially developed, 10-ton, mobile track leveling jack. The jack, operated manually, is used for the initial track ballasting.

Two heavy lifting jacks are mounted on a shoe, and a track-lifting beam above the jacks. This equipment is attached to a railroad handcar having a special platform for the operator. A wire rope connects the jack shoe to a drum, and a double-ratchet wheel hoists the jacks during transportation.

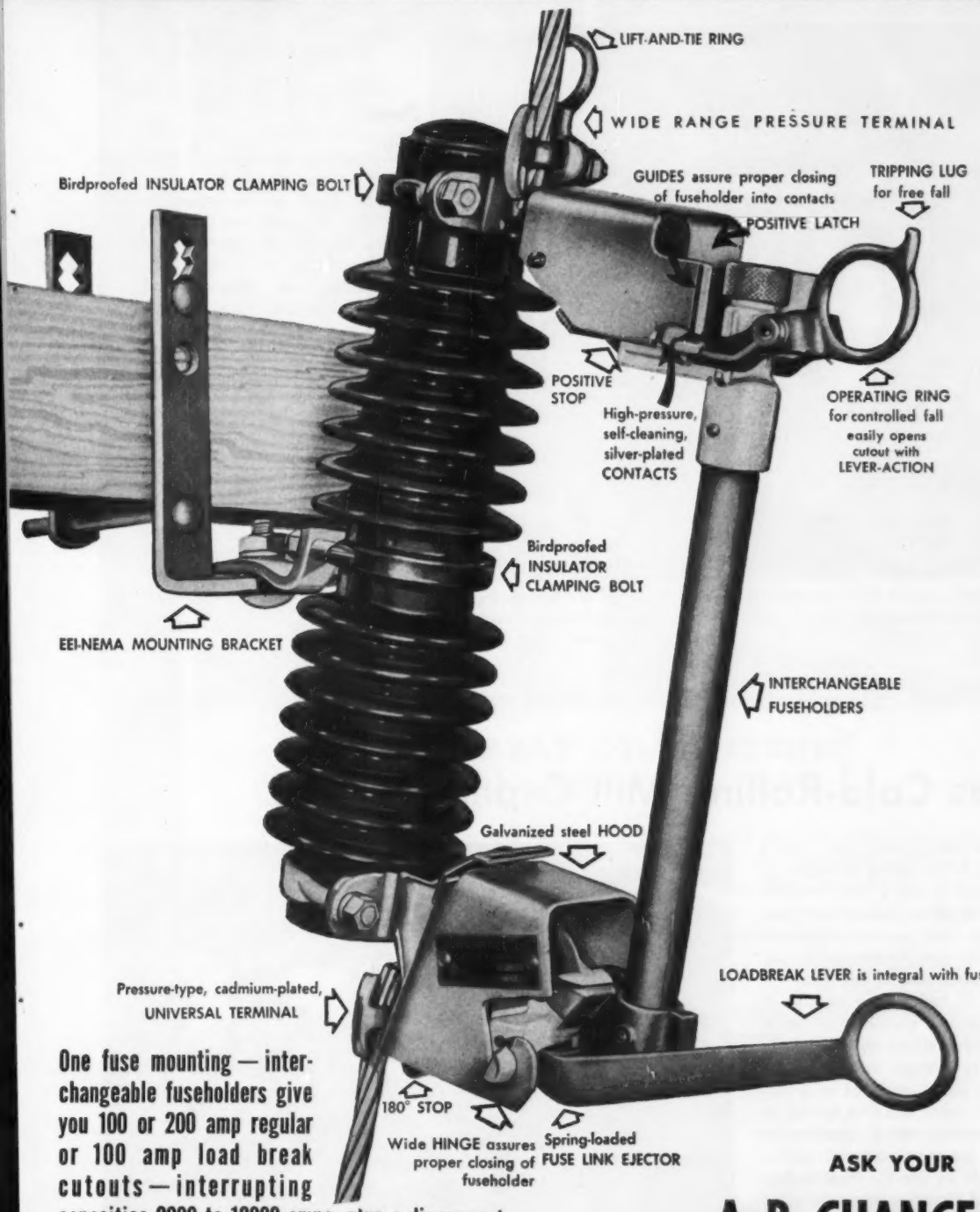


To use the leveling jack, ballast is cleared from between two ties to allow for setting the jack shoe beam and rail hook. The jacks are lowered, hooks set, and the rails are then jacked to grade. A carpenter's level on the jacking beam indicates when the rails are at the same elevation. Ballast is tamped under the two ties adjacent to the jacks, the jacks are released, and the car moves on.

Normally, the rails are jacked every 20 ft. Four men are required to operate the jacking machine. One man turns the crank for raising the jacks, two men manipulate the jacks and rail hooks, one works ahead.

About 2,200 ft of track are leveled in one day. Progress is 30% greater and only half the men required.

18 reasons for specifying this CHANCE "F" CUTOUT


LIFT-AND-TIE RING
WIDE RANGE PRESSURE TERMINAL
Birdproofed INSULATOR CLAMPING BOLT
GUIDES assure proper closing of fuseholder into contacts
TRIPPING LUG for free fall
POSITIVE LATCH
POSITIVE STOP
High-pressure, self-cleaning, silver-plated CONTACTS
OPERATING RING for controlled fall easily opens cutout with LEVER-ACTION
Birdproofed INSULATOR CLAMPING BOLT
EEI-NEMA MOUNTING BRACKET
INTERCHANGEABLE FUSEHOLDERS
Galvanized steel HOOD
LOADBREAK LEVER is integral with fuseholder
Pressure-type, cadmium-plated, UNIVERSAL TERMINAL
180° STOP
Wide HINGE assures proper closing of fuseholder
Spring-loaded FUSE LINK EJECTOR

One fuse mounting — interchangeable fuseholders give you 100 or 200 amp regular or 100 amp load break cutouts — interrupting capacities 2000 to 12000 amps, plus a disconnect

11 possible combinations with 1 fuse mounting—5.2, 7.8, 15 kv ratings. Simplify your cutout stocking problems and lower your storage, handling and installation costs with the Chance Type "F" line of cutouts. Built for your *present* and *future* requirements. You need stock only one type of fuse mounting and a choice of fuseholders for complete system protection.

CK56-23

ASK YOUR

A·B·CHANCE CO·

DISTRIBUTOR

"What do you want in the CUTOUTS you buy?" Write A. B. Chance Co., Centralia, Mo. for this free booklet today.

Electric Heating of Plating Tanks Efficient

OVER-THE-SIDE IMMERSION HEATERS in plating tanks of the Vendo Co plant have accurate temperature control, high efficiency, low maintenance costs

J. H. TARBELL, Industrial Engineer, Kansas City Power & Light Co, Kansas City, Mo.

Over-the-side immersion heaters totaling 220 kw have been installed in the plating plant of the Vendo Co of Kansas City, Mo. The heaters are quartz glass covered and were selected for their ease of installation, accessibility, and high efficiency. Studies were made to determine the relative merits of steam and electricity for heating the plating tanks. Drawings were prepared for both methods.

Meets Expectations

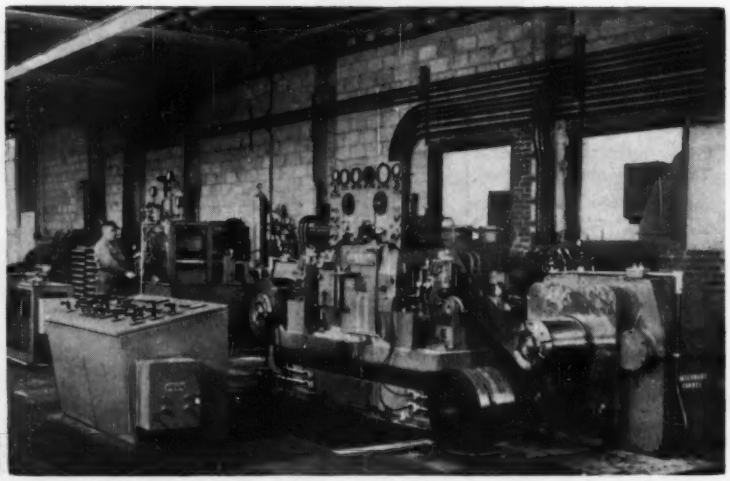
Electric equipment was chosen because of the excellent temperature control available with it, the low maintenance costs and the advantages of eliminating problems and expense of replacing steam valves and fittings. The plating plant has been in operation six months. Energy use is averaging $6,000 per year. The equipment is meeting all expectations.

Vendo manufactures vending machines.

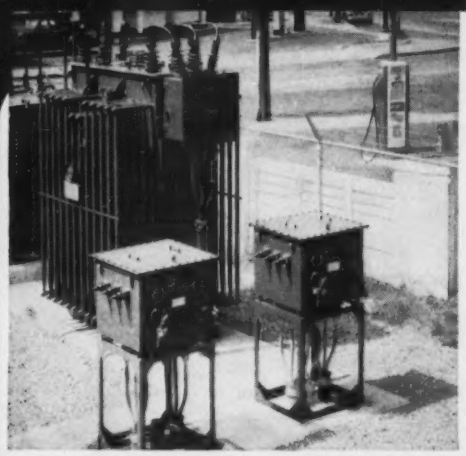
Hikes Cold-Rolling Mill Capacity 50%

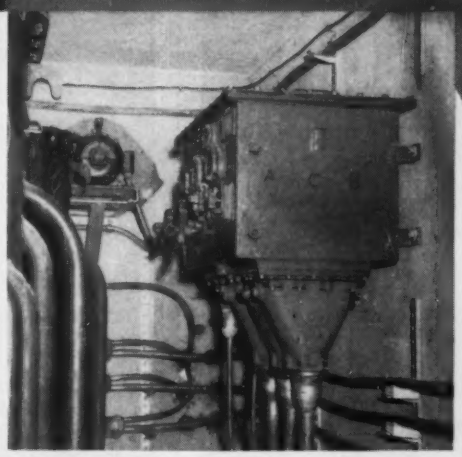
A 16-in. cold-rolling mill, largest of its kind in the spring industry and first designed to use a water-emulsifiable mineral oil as coolant and lubricant for the rolls, is now in full-scale operation at the Forestville, Conn., plant of Associated Spring Corp. It is capable of rolling strip steel up to 13 in. wide and increases by up to 50% the steel-rolling capacity of the plant. It rolls much thinner gauges.

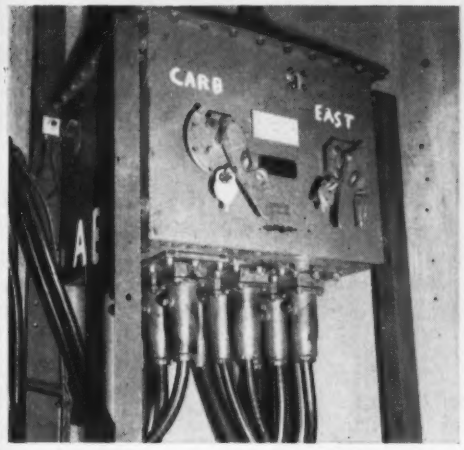
The new mill is powered by a 500-hp dc mill motor and two 400-hp dc winder motors, which combine to make this the most powerful mill of its type. Dc to operate these motors is generated by a motor-generator set, the drive motor of which is a 1,000-hp, 2,300-v synchronous motor. Hydraulic power comes from two separate pump units, a 5-hp and a 15-hp unit.

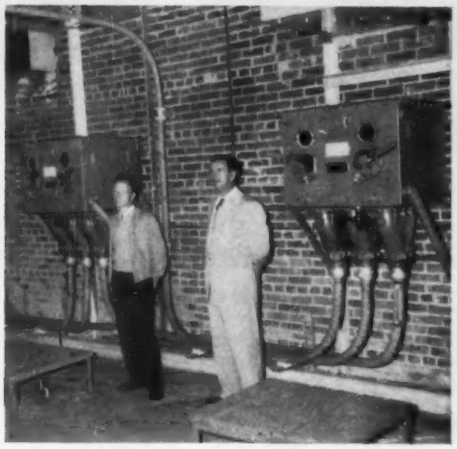


COLD-ROLLING MILL is powered by a 500-hp dc mill motor and two 400-hp dc winder motors. These combine to make it the most powerful mill of its type









LOAD BREAK OIL SWITCHES

make cable systems f-l-e-x-i-b-l-e

G&W TYPE "RA" OIL SWITCHES provide safe, convenient and low cost means for sectionalizing distribution circuits. They have been used since 1928 by many electric utilities. They have a remarkable trouble-free operating record which fully justifies their use as load break disconnects for single and multiple circuits. They are simple in construction, installation and maintenance. They operate properly after long periods of inactivity to provide for isolation of cable sections in case of faults. They permit rapid re-routing of circuits to materially reduce losses incurred through electric service interruptions. They are made in many styles for 2 way to 6 way, cable or overhead connections, 400 ampere, voltages up to 34.5 Kv.

It will pay you to investigate the possibilities of Type "RA" oil switches for your distribution system. Send for Bulletin DB51 and call in our engineer representative.

G&W ELECTRIC SPECIALTY CO.
7780 Dante Avenue, Chicago 19, Illinois

Canadian Mfrs.—Powerlite Devices, Ltd.
Toronto, Montreal and Vancouver

Representatives in principal cities of U.S.A.

D562

Pat. Pend.

*KLEIN KUT PLIERS

for both regular and heavy-duty cutting

It was Klein that produced the first and still the finest regular side-cutting plier. Klein also gave the industry the modern, streamlined version so much in demand.

And it's Klein again with a new, high leverage cutting plier for light- or heavy-gauge wire, including No. 2 weatherproof hard drawn solid copper wire, and A.C.S.R.

There's no extra hinging of any kind—no uncomfortable wide-spread handles—with this new Klein-Kut Plier. The offset hinge permits the extra-high leverage and operation is as smooth and easy as with any other Klein Plier. Forged from high-grade tool steel, individually fitted, tempered, adjusted and tested. Ask for No. 213-9 N.E. for streamlined pattern.

Regular pattern available

Same high-leverage design, but in the original Klein side-cutting pattern. Ask for No. 213-9.

Write for free Copy of Bulletin 1054

*Trade Mark

ASK YOUR SUPPLIER

Foreign Distributor: International Standard Electric Corp., New York.

"Since 1857"

Mathias KLEIN & Sons

DISTINCTIVE FINISHES on custom-built tables are dried in a 2-min pass through 8-kw infrared oven. Glue-drying time is cut to 10 sec by high-frequency unit

Electric Heat Speeds Custom Tables

DON WIRT, Industrial and Commercial Representative, Western Division, Puget Sound Power & Light Co, Seattle, Wash.

By removing and drying finishes fast, electric heat has put production of custom-built tables on an assembly-line basis for Ken Kraft, Inc, Port Townsend, Wash. Installation of an 8-kw infrared drying oven and conveyor, plus a small high-frequency unit for glue drying, enables a four-man crew to complete 30 tables a day.

The initial problem was removal of atmospheric moisture absorbed by ash plywood during shipment to the plant. This moisture cannot be removed by storage at ordinary room temperatures. Moisture is driven out during a 2-min pass through the drying oven. Heat from the lamps need only penetrate to the first glue-line of the ⅛-in. thickness of veneer for satisfactory drying.

The second problem was fast drying of the finish in any one of ten different colors. The infrared oven permits sequential applications of filler, stain, and laquers in rapid succession. Each table top receives the complete finish before moving along to final assembly.

Successive applications require only 2 min in the oven as compared with 2 to 4 hr of drying at room temperature previously. Quick drying obviates placing pieces in racks between applications. It also has reduced handling and released storage space for productive use. Drying of glue, for parquet and herringbone designs, is accomplished in 10 sec by the small high-frequency unit.

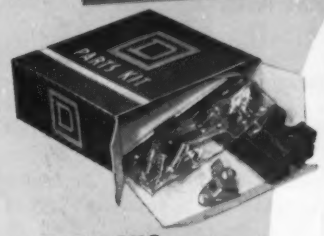
High Frequency Induction Melts Silver Fast

G. B. NEWTON, Power Sales Engineer, Attleboro Steam & Electric Co, Attleboro, Mass.

A high-frequency induction furnace is now melting silver at the plant of Leach & Garner Co, Attleboro, Mass. A 35-kw, 30,000-cps unit was chosen to replace gas and oil as a source of heat. The furnace has a plate voltage of 7,700 and can raise a 1,000-oz melt of silver to 2,000F in 15 min. This is twice as fast and much safer than formerly. Furthermore, the induction unit requires less labor and fosters cooler, more comfortable working conditions. This installation has been so satisfactory that the company bought a second unit of the same characteristics to increase production even more.

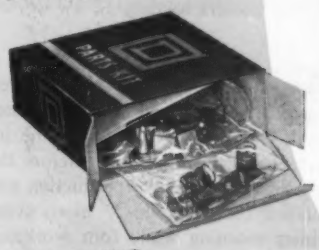
Qwik Change

with PACKAGED MOTOR STARTER PARTS!



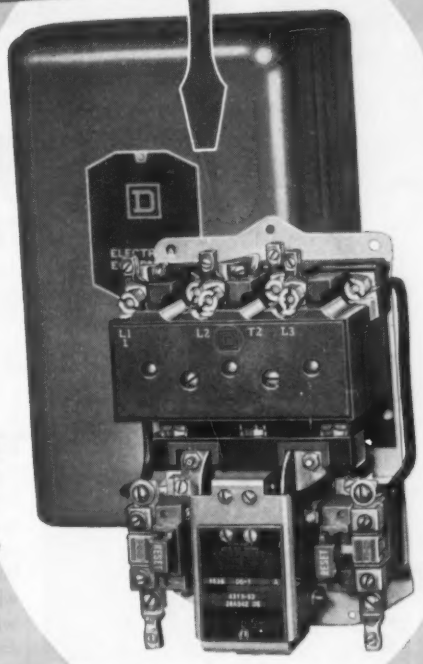
INTERLOCKS

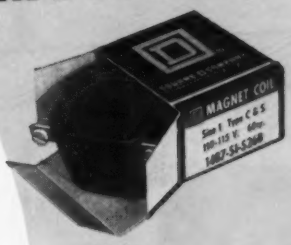
A wide variety of quick-change, front-mounted interlocks adds flexibility for special applications



CONTACTS

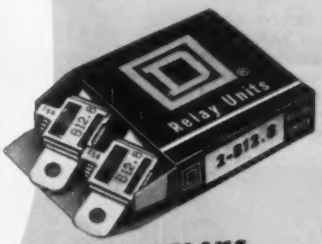
Packaged replacement contacts are easily installed without disturbing wiring





COILS

Screwdriver is only tool required for quick change of magnet coil to accommodate different voltages



O.L. RELAYS

A wide variety of easily selected, packaged overload relay heater units provides quick changes to meet varying requirements for overload protection

PUSH BUTTONS AND SELECTOR SWITCH

These Kits contain all parts necessary to make quick changes from standard starters to either push button or selector switch controlled devices

EASY to Identify!
EASY to Buy!
FASTER to Install!

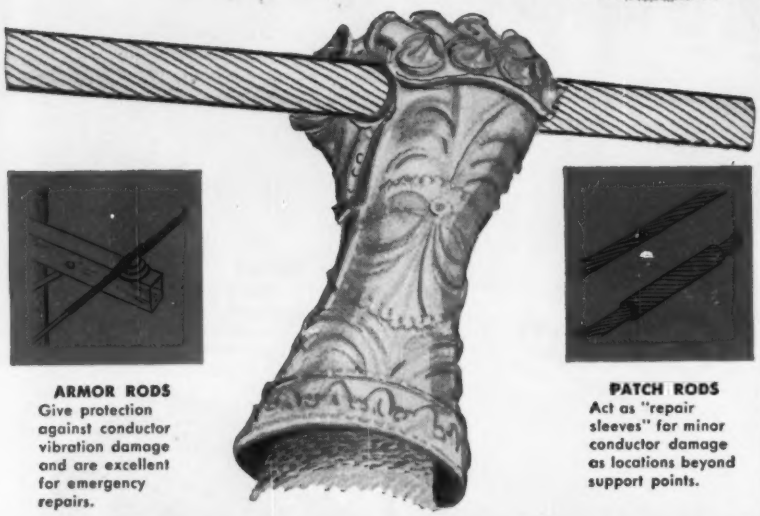
NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE!

SQUARE D COMPANY

WHEREVER *Protection* IS NEEDED ON OVERHEAD CONDUCTOR LINES

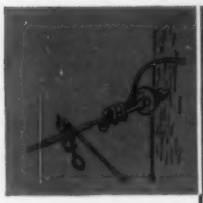
fine FANNER *Superformed* PRODUCTS

provide it better... easier... at substantial savings



ARMOR RODS
Give protection against conductor vibration damage and are excellent for emergency repairs.

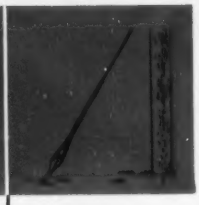
PATCH RODS
Act as "repair sleeves" for minor conductor damage as locations beyond support points.



TAP ARMOR
Protective layer of shortened rods facilitate making taps without risking conductor damage.

PLASTIC FANNGUARDS
Tough, durable plastic sleeves used on covered wires for protection against tree abrasion.

ALUMINUM LINEGUARDS
Made to protect triplex cable or bare conductors against abrasion electrical damage.



FANNGRIPS
For a permanently positive grip on guy strand with maximum economy in material and labor.

Whenever you need accessory items for overhead distribution and transmission lines, you'll do far better by standardizing on Fine FANNER Superformed PRODUCTS. Each product in the FANNER Superformed line is precision manufactured to install easier and faster on the job. Careful packing insures safe delivery and simplified storage. Highest quality materials provide long life regardless of the type of installation. With all their extra features, FANNER Superformed PRODUCTS cost no more than ordinary products. For full information on the Fine FANNER Superformed Line, write for literature and prices today!

Licensed for use under Patent No. 2,275,019

Fine FANNER Superformed

THE FANNER MANUFACTURING CO.
Electrical Products Division
Brookside Park Established 1894 Cleveland 9, Ohio

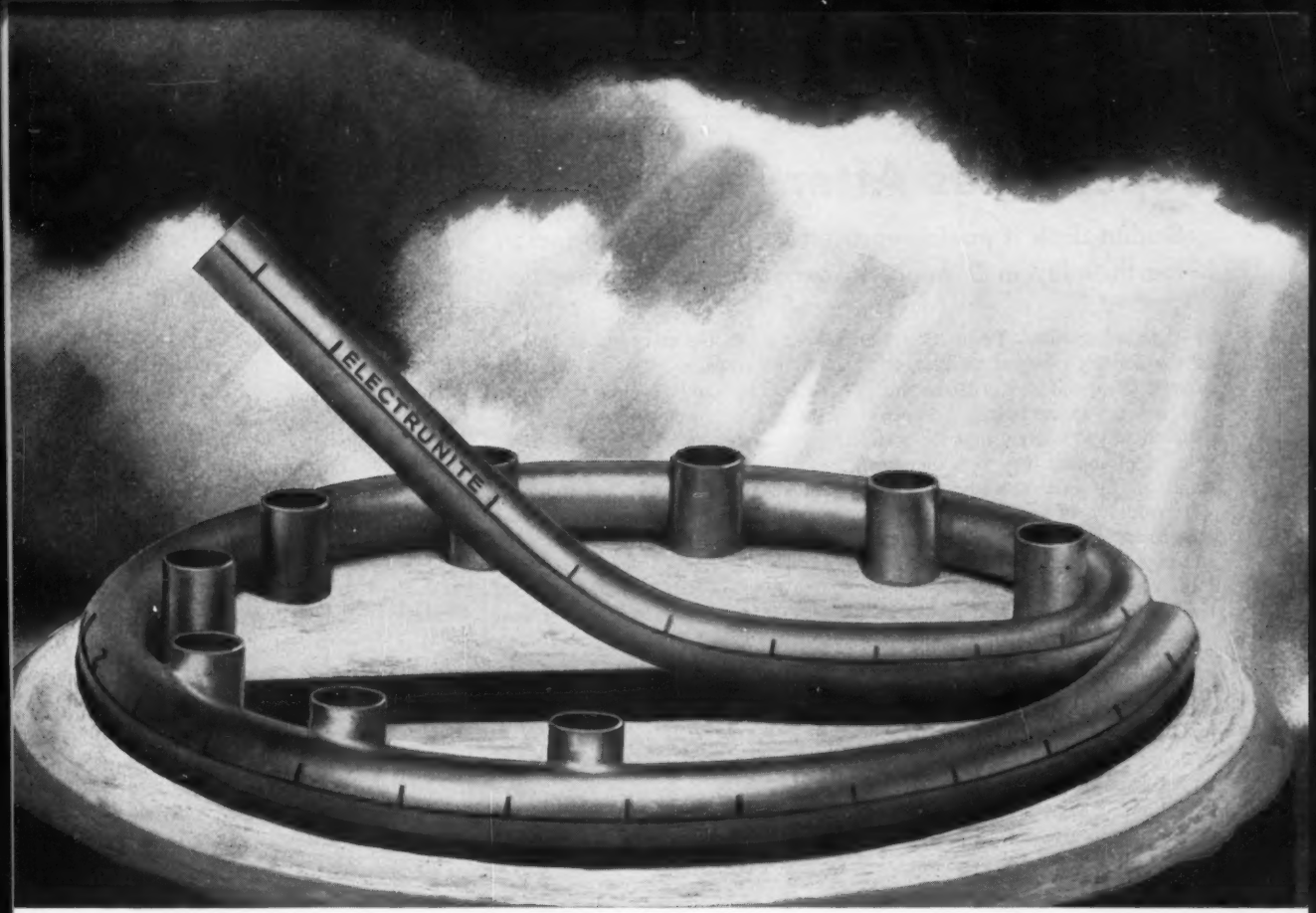
AGENTS AND DISTRIBUTORS IN PRINCIPAL CITIES

INDUSTRIAL BRIEFS

A salt bath for treating small parts is heated by 18 1,000-w strip heaters at the Monarch Machine Tool Co plant, Sidney, Ohio. The strip heaters were placed six on each side and six on the bottom of the tank. The shell was filled with fiberglass insulation. The 18-kw installation brings the temperature of the salt bath to 200C in 45 min. Formerly the salt bath was started with steam coils and was then heated by gas. It required 5 hr to bring the bath to operating temperature of 200C. The new installation eliminates piping and combustion fumes. Power sales engineer was George H. Maier, Dayton Power & Light Co, Dayton, Ohio.

Bananas, highly susceptible to temperature damage, are ripened in a special room of the A. Centineo Fruit Co, Baltimore, by all-electric cooling and heating equipment. Automatic thermostat controls ensure delivery of just the right amount of heat or refrigeration for perfect ripening without spoilage. The artificial climate can be gently warmed or cooled to speed or retard ripening. Compact electric heaters totaling 12 kw do the job.

Brick production is no longer delayed by cold weather at Roanoke-Webster Brick Co, Webster, Va, since the installation of infrared heat. Before the installation was made, production was delayed for an hour or more every winter morning while four workmen with sledge hammers broke the ice formation in the dicharge throat of the clay bin, according to A.M. Harvey, company secretary. The bin, 16 ft in dia, stores enough clay to manufacture 15,000 bricks. Clay is fed through a disc feeder at the bottom of the bin onto a belt conveyor feeding the pug mill and brick machine. On our recommendation the customer installed 12 375-w (4.5-kw) infrared lamps spaced about 18 in. apart around the lower portion of the bin and discharge throat. The lamp sockets are mounted on an angle-iron bracket which is welded to the bin framework. This installation has proved so satisfactory that the management has ordered infrared lamps to equip a second bin. R. L. Mills, Power Sales Department, Appalachian Electric Power Co, Roanoke, Va.



IT'S *Time* YOU SAVE

with Republic "Inch-Marked"® E.M.T.

Utilities throughout the United States have discovered that the amount of time saved installing Republic ELECTRUNITE® E.M.T. converts to a substantial dollar saving.

Republic E.M.T. goes in fast. But more important, *it goes in to stay.* Even after ten, fifteen, or twenty-five years of service, utilities report that Republic ELECTRUNITE E.M.T. still provides trouble-free protection for their electrical systems . . . whether the conduit is exposed or imbedded in concrete. Excellent for use in concrete jobs, millions of feet have been installed with good results.

Exclusive advantages make Republic ELECTRUNITE E.M.T. easy to install fast. A longitudinal Guide-Line helps keep bends in the same plane, avoid costly delays. "Inch-Marks" help assure fast measuring, accurate bending. There's no kinking . . . no wrinkling . . . because ELECTRUNITE is *uniformly ductile.* Moreover, it's lightweight and easier to handle . . . which further reduces costs.

You get additional savings because there are no threads to cut, no runs to turn. Every joint becomes a union. And since threading is unnecessary, the tightly adhering galvanized coating remains unbroken—assuring permanent end-to-end circuit protection from corrosion.

Isn't it time you saved with Republic ELECTRUNITE E.M.T.? It will pay you to check further into the important cost advantages. It's produced to A.S.A. Specification C-80.3. Federal Specification WW-T-806 and carries the Underwriters' Laboratories Seal of Inspection. *Send for your free copy of 84-page* ELECTRUNITE *bending instruction booklet.*

REPUBLIC STEEL

Steel and Tubes Division

213 East 131st Street • Cleveland 8, Ohio

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

Vepco Goes After Heating

Studies show it would improve future annual load factor; Is fourth utility in 8 weeks to announce active promotion

Virginia Electric & Power Co, one of the country's largest utilities, will promote year-round air conditioning and electric space heating. Vepco's decision to get actively into the market is prompted by two findings turned up by a recent study.

1. Addition of the heat pump and other electric heating loads would result in a better annual load factor in future years when summer air conditioning loads will cause a higher kw system annual peak.

2. Various forms of electric heating and cooling already have received encouraging customer acceptance in the Vepco territory.

Vepco is the fourth large utility reported here in the past eight weeks to announce aggressive heating promotion plans. Before launching its all-out drive, the company intends to build its trade cooperation and step up heating and cooling technical training for its sales personnel. It already has conducted a two-day training school for 35 of its key salesmen. And an additional 13 staff members have completed a heat pump course at General Electric Co's Weathertron Institute. An explanatory booklet outlining fundamentals of year-round air conditioning will be published under company imprint and distributed to the building trade and prospective homeowners. Display materials and other forms of advertising will be scheduled under a coordinated program with manufacturers, distributors, and dealers.

Ultimate objective of the promotion, says C. E. "Speedy" Anderson, Vepco's commercial and residential sales manager, will be not only to sell, but to assure the customer an installation satisfactory in performance and economy. To further this aim, the utility will work closely with manufacturers, distributors, contractors and other trade allies. Anderson says his staff will keep a watchful eye on all jobs to assure 1. adequate construction and engineering specification, 2. effective insulation of the space to be heated, 3. proper installation of heating units, 4. sufficient thermostatic controls to provide operating economy.

Manufacturers representatives and other industry personnel who helped conduct Vepco's two-day training school include: Russell Ranson and O. M. Thompson, Edwin L. Weigand Co; B. A. Needham, Continental Radiant Glass Heating Corp; H. S. Steece, Libby-Owens Ford Glass Co; F. T. Walsh, Sunwarm, Inc; W. O. Tirrill, Westinghouse Electric Corp; Robert Cressman, G.E.; T. L. Sharkey, Ebasco Services, Inc; and G. A. Erickson, Wood Conversion Co.

New Electric Heating Thermostats Announced

Two low-priced line voltage thermostats said to take the heat "peaks" and cold "valleys" out of electric heating have been announced by Minneapolis-Honeywell Regulator Co. One, designated the T-40, is designed for low-mass, quick heating and cooling units. The other (T-41) is suited for large-mass, slow heating and cooling systems such as ceiling and floor cable.

The T-40, says its maker, is responsive to as little as 0.4 F temperature change, and is designed to cycle up to 15 to 20 times per hr under a normal 50% heating load requirement. The T-41 uses slow cycling periods (three to six times per hr), has operating differential of 1 F.

2-Unit, Outdoor-Indoor Heat Pump Unveiled

A "two-package" heat pump—one unit designed for outdoor installation and remotely controlled by another unit inside the home—is announced by Westinghouse Electric Corp.

Said to occupy about one-fourth the inside space of present single-cabinet heat pumps, the new dual unit is planned for homes with no basements, small utility rooms, or insufficient attic space. All operating mechanisms are contained in the outdoor unit. The inside package holds air handling equipment, ie, controls, fan and coils.

Called the "Hideaway Heat Pump", it is available in three-ton size at $1,400 to $1,500 and five-ton size at about $1,900 to $1,950.

AG&E Financing Stimulates Employee House Heating

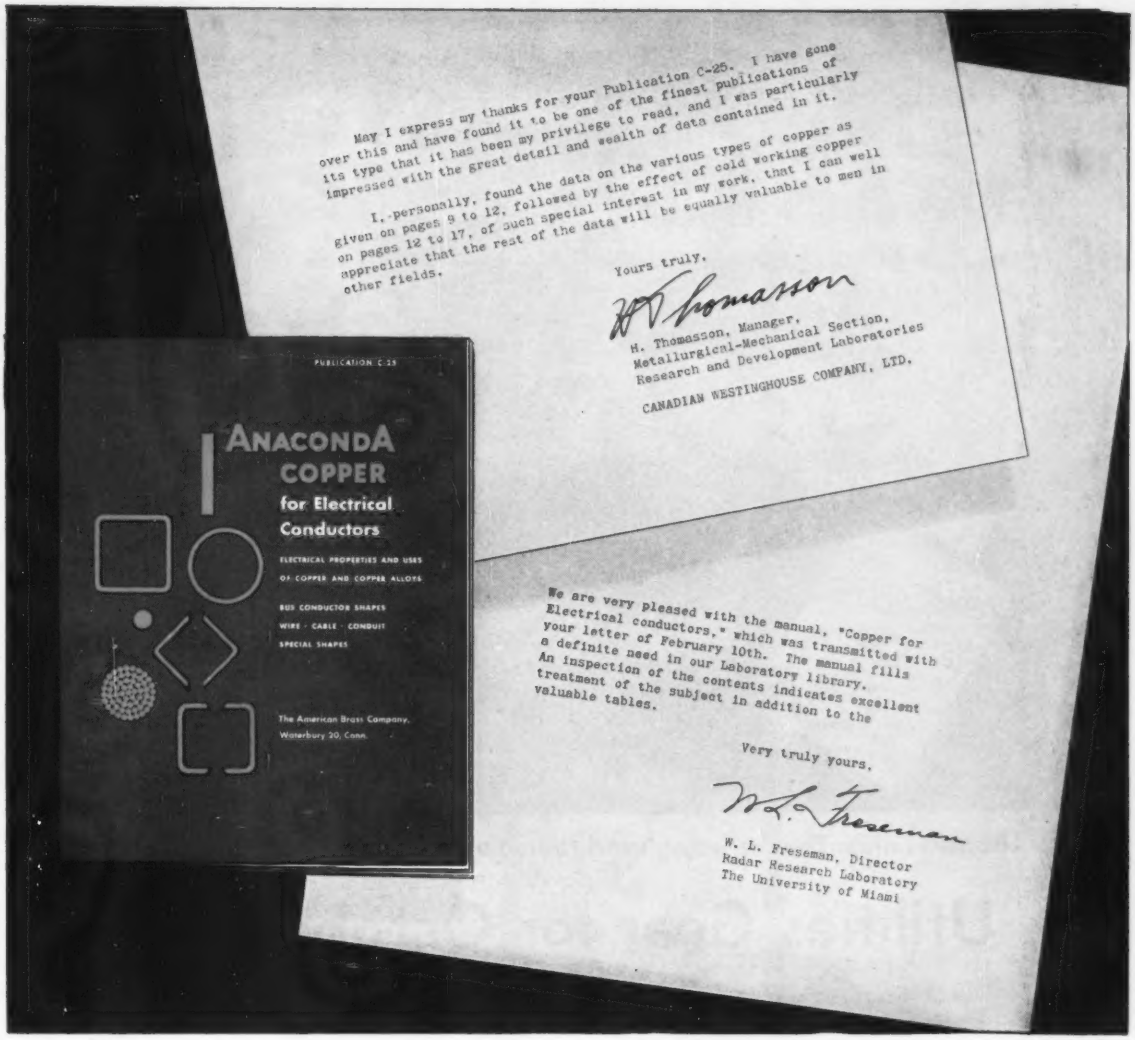
American Gas & Electric Co offers its employees a plan for financing electric house heating. It covers cost of equipment, installation, insulation, and cost of storm doors and windows if needed. Workers can take up to five years to repay at low rates.

"The plan is designed principally to aid employees who plan to remodel existing homes," says E. A. Snyder, manager of AGE's Sales Division. "Regular FHA financing normally takes care of new home construction."

The plan has been in effect for several months, and so far, says Snyder, it is meeting with good acceptance. The company also has an employee plan for financing heat pumps.

A.C. Sells Apt. Wiring

A folder plugging air conditioning is helping the Electric Association of Chicago to alert apartment house owners and management people to the need for better wiring in rental buildings. Titled "People Crave Comfort," the folder reminds the apartment house owner of last summer when 45 hot days sent the thermometer to the 90F mark or above and sent thousands of Chicago apartment dwellers on a search for quarters where air conditioning would be possible. "Why not re-wire now for air conditioning?," the piece asks. Some 25,000 copies were mailed late in June.


May I express my thanks for your Publication C-25. I have gone over this and have found it to be one of the finest publications of its type that it has been my privilege to read, and I was particularly impressed with the great detail and wealth of data contained in it.
I, personally, found the data on the various types of copper as given on pages 9 to 12, followed by the effect of cold working copper on pages 12 to 17, of such special interest in my work, that I can well appreciate that the rest of the data will be equally valuable to men in other fields.
Yours truly,
H. Thomasson, Manager,
Metallurgical-Mechanical Section,
Research and Development Laboratories
CANADIAN WESTINGHOUSE COMPANY, LTD.
PUBLICATION C-25
ANACONDA
COPPER
for Electrical
Conductors
ELECTRICAL PROPERTIES AND USES OF COPPER AND COPPER ALLOYS
BUS CONDUCTOR SHAPES
WIRE · CABLE · CONDUIT
SPECIAL SHAPES
The American Brass Company,
Waterbury 20, Conn.
We are very pleased with the manual, "Copper for Electrical conductors," which was transmitted with your letter of February 10th. The manual fills a definite need in our Laboratory library. An inspection of the contents indicates excellent treatment of the subject in addition to the valuable tables.
Very truly yours,
W. L. Freseman, Director
Radar Research Laboratory
The University of Miami

The excerpts from letters shown above are representative of comments we've received from people whose opinions we respect very highly.

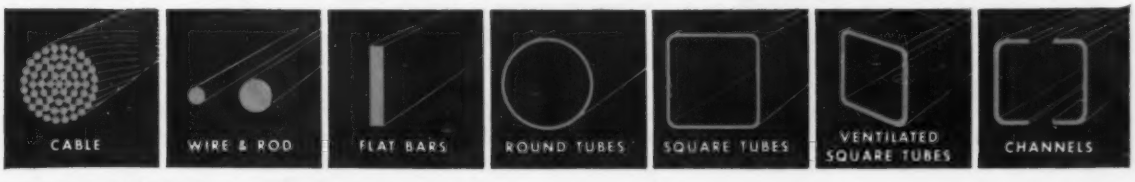
In the new Sixth Edition of Publication C-25, "Anaconda Copper for Electrical Conductors," we tried to make a helpful, practical book—with a concise statement of the latest information on the general properties of copper conductors—plus convenient new tables giving the physical and electrical data on all types of rigid copper conductors for the most commonly used sizes.

If you do not have your copy of Publication C-25—or if you would like the assistance of Anaconda specialists in the selection of copper conductors to meet your special needs—see your nearby Anaconda representative. Or write: The American Brass Company, Waterbury 20, Conn.

56102

ANACONDA® COPPER CONDUCTORS

THERE'S AN ANACONDA ELECTRICAL CONDUCTOR FOR EVERY NEED



New LBE sales aids: They're being used to line up retail help as . . .

Utilities Gear for October Push

A high-powered drive to woo more retail help is afoot right now as utilities get set for all-out Live Better Electrically sales push in October (EW, July 16, p 15).

More than 1,000 power suppliers are expected to spearhead local activities during the month, reports LBE headquarters. Many of them plan to generate special LBE newspaper promotions. And to back them up, a barrage of national magazine and television advertising is being scheduled. All together, more than 100 million people are expected to hear the Live Better Electrically message sometime during the month.

But preliminary to the push is the campaign to bring more appliance dealers and other interested retailers into the LBE camp. Full story of the October drive will be plumped in an eight-page supplement in Retailing Daily's Sept. 6th issue. Section will outline LBE's profit potential for retailers, spell out the magnitude of the October promotion activities, and offer definite suggestions and ideas by which the dealer can tie-in. Among them: Observing an LBE week or month, displaying appliances around a given page of the LBE consumer idea book, arranging "before and after" store windows, dramatizing one of the current series of LBE consumer ads in a window or floor display, setting up special LBE centers to be staffed by a home economist from the local utility.

Insert also includes a full-color reproduction of a new LBE "kitchen" ad, which is scheduled for October space in Saturday Evening Post, Life, Good Housekeeping, and House Beautiful. The last mentioned magazine will attach the LBE consumer idea booklet, "New Step by Step Ideas to Help You Live Better . . . Electrically" to the front cover of every one of its 420,000 October newstand copies. Meanwhile, electrical and allied industries are lining up tie-in ad space and the magazine says it will throw the full support of its entire organization into merchandising the issue.

Besides magazines, the October national advertising will be concentrated heavily in television. A special LBE commercial is slated for Sunday, Oct. 21 on the General Electric Theatre on a 155-station CBS network. Show will feature a yet unnamed star whose box office appeal is expected to attract over 35 million viewers. Westinghouse Electric Corp also will spur the campaign with space advertising plus a number of LBE commercials on Studio One and on their political convention and election coverage.

Department stores likewise figure big in the October plans. A special flip-over presentation has been pre-

(*Continued on page* 158)

DETROIT EDISON REPORTS:

We use clean Penta-treated poles for long service life under severe weather conditions

In Detroit Edison's 120,000-volt "H"-frame line, supporting poles are Penta-treated. Heavy treatment means maximum protection against decay. Because Penta won't bleed or leach out to burn hands, pole handling and installation are easier, faster and more pleasant.

Detroit Edison says:

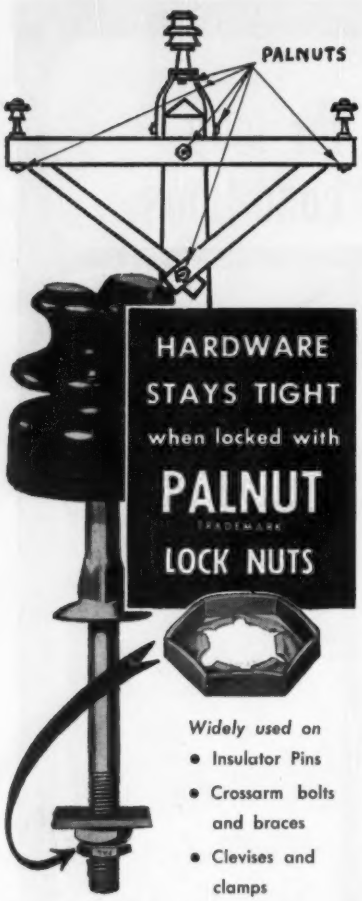
"We believe heavy Penta treatment gives our poles a service life of upwards of 30 years... even under severe conditions."

You can measure Penta protection. Penta is a uniform, never-varying chemical compound. Increment borings from Penta-treated poles can be chemically analyzed. Such analysis gives *positive proof* of Penta's protective staying power.

Cut maintenance costs by specifying Penta-treated poles, crossarms, transformer platforms, braces, control boxes and planking. For a list of over 85 dependable and cooperative treating plants—and your copy of the free booklet, "Poles and Crossarms"—write: MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, Dept. PI-4, St. Louis 1, Missouri.

MONSANTO

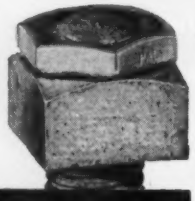
WHERE CREATIVE CHEMISTRY WORKS WONDERS FOR YOU



• Eliminate checking and re-tightening
• Eliminate radio interference due to loose hardware

Every bolt-and-nut assembly locked with PALNUT Lock Nuts stays tight, despite weather, wind, stress and vibration. PALNUTS, tightened on top of the regular nuts, prevent loosening and falling off. Very low in cost—easily, speedily applied—require little space—may be used on new or existing assemblies. Hot dip galvanized, silicon bronze and other materials and finishes. Stocked by all leading pole line hardware manufacturers.

The PALNUT Co.
51 Glen Road
Mountainside
N. J.



PALNUT
TRADE MARK
LOCK NUTS
for quick, secure fastening at low cost

Utilities Gear LBE Push

(*Continued from page* 156)

pared and utilities are using it to line up support. Presentation contains a variety of tested department store merchandising ideas built around the LBE theme.

To prime local newspapers to the October push, a four-page LBE newspaper supplement was released to 1,890 daily and 9,381 weekly newspapers across the country in the Aug 4 Publishers Auxiliary. Supplement was designed to assist newspapers in developing special pages and sections devoted to benefits of electrical living. Publishers are told how they can get advertising mats and other materials from their local utilities.

Before the fall campaign is over, more than 2,600 electric distributors, 75 electrical manufacturers plus their suppliers, 27 trade associations, and 18,000 lending institutions are expected to take part.

S & S SHORTS

Law to Spark Disposer Sales

Sales of 15,000 electric food disposers a month are expected within a year in Detroit where a local law requires all new homes to be equipped with the units. City hopes it will help trim rising garbage collection costs which now total over $5½ million. Some 45,000 Detroit homes now have food disposers.

Wiring Help Breaks Sales Quota

New Jersey Power & Light Co's wiring allowances for ranges and water heaters sold to customers with 30-amp service (EW, June 25, p 168) helped push sales 108% of quota in a six-week drive just concluded. Some 651 range and 434 water heater purchases were tallied. More than 20 dealers qualified for bonus prizes of $30, $60, and $100 for selling 10, 15, and 20 units each. Company will continue wiring allowances on combination range and heater sales.

Sales Tie-in Aid Ready

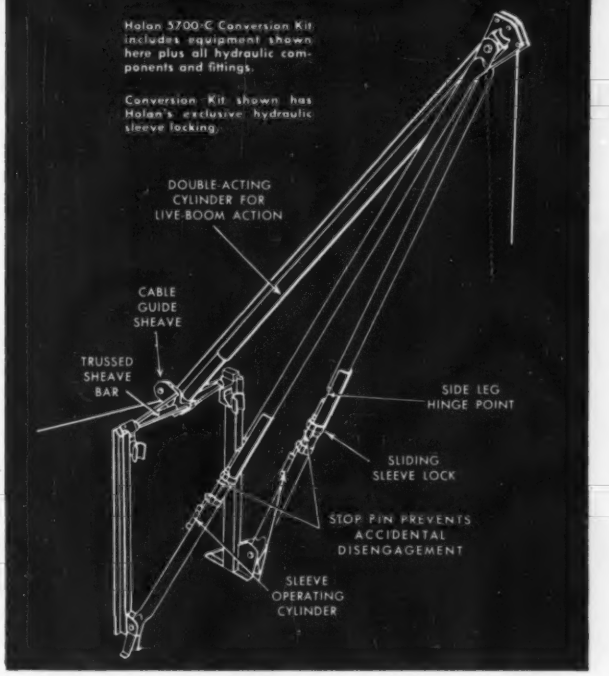
A sales program brochure to help utilities cordinate load building activities with "Live Better . . . Electrically," "Housepower," and "Operation Home Improvement" is now available from Hotpoint Co.

Best Housewares Display

Prize winner in this year's Electric Housewares Window Display Contest is this window in Ohio Edison Co's Springfield, Ohio office. This same office also earlier was named a utility winner of an Electric Fan Window Display competition. Both contests are sponsored by the National Electrical Manufacturers Association.

(*More SS on page* 160)

NEW HOLAN DERRICK CONVERSION KIT


Holan 5700-C Conversion Kit includes equipment shown here plus all hydraulic components and fittings.
Conversion Kit shown has Holan's exclusive hydraulic sleeve locking.
DOUBLE-ACTING CYLINDER FOR LIVE-BOOM ACTION
CABLE GUIDE SHEAVE
TRUSSED SHEAVE BAR
SIDE LEG HINGE POINT
SLIDING SLEEVE LOCK
STOP PIN PREVENTS ACCIDENTAL DISENGAGEMENT
SLEEVE OPERATING CYLINDER

MAKES OLD DERRICKS COME TO LIFE

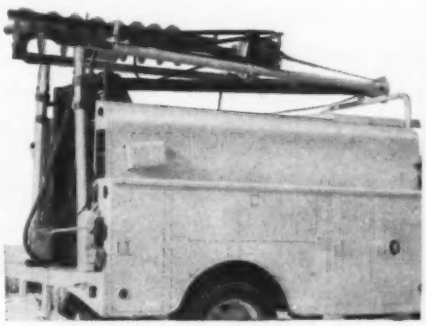
Now your rigid tripod-type derricks can be converted to lift poles from an infinite number of positions . . . fold over the cab for stowage . . . and rise ready for action in seconds. The new Holan Derrick Conversion Kit does the trick—even though you have a single-drum winch.

With the Holan Kit, a mechanic can convert your derricks to hydraulically-operated units right in the field. He cuts and hinges the side legs, and cuts the center leg for installation of the double-acting cylinder. All hydraulic components and equipment are in the Kit.

You can specify pin-type locking or Holan's exclusive hydraulic sleeve locking. Write for data about the Holan Series 5700-C Conversion Kit.

Here's how your converted derrick will look in action when converted to hydraulic operation by the new Holan Conversion Kit.

Converted derrick folds over into stowage position . . . comes back up in seconds. Optional cradle shown here enables you to stow diggers overhead instead of in body.



Line construction bodies for light to heavy-duty. Crew compartments optional. Efficient tool compartments and drawers.

Aerial arm for spotting workmen 37 feet above ground, 9 feet below ground level. Double-basket unit extends 45 feet. Rotates 360°.

Service bodies for chassis up to 1½ ton. Lengths, 72", 75", 84", 90" and 102".

Hydraulic Derricks designed for front or rear mounting. Capacities to 12,000 lbs.

Light-duty power operated derricks for front or rear mounting. Operating range of 146°.

Ladders to 40' with all phases completely hydraulic. Pump actuated by P.T.O. or separate engine drive with electric starter.

Mechanical Ladders expertly engineered and counterbalanced for effortless handling. Maximum heights from 24' to 32'. Swings 360°; angles to 72°.

Portable hydraulic and mechanical earth borers. Augers for 8" to 20" diameters, depth to 8'.

Wide variety of pole and reel trailers. Standard and special. Many optional features.

Hydraulic jacks, controlled from rear of truck. Rigid mounted or patented Holan self-stowing types.

Hydraulic towers with rotary, stationary, or transverse platforms. Exclusive box-girder telescoping mast.

J.H. HOLAN CORPORATION

4100 WEST 150TH STREET
CLEVELAND 11, OHIO

OTHER PLANTS:
HOLAN CORPORATION OF GEORGIA, Griffin, Ga. • J. H. HOLAN CORP., Phoenix Div., Arizona
BRANTFORD-HOLAN LIMITED, Brantford, Ontario

It's a Hit!
It's Collyer's Suprene Type RR Cable! This extremely tough, neoprene-jacketed cable is equally at home on aerial, direct burial, conduit, and underground network systems. It is available in shielded or unshielded constructions, for either standard or custom specifications, for all voltages from 0 to 8000. Send for samples, prices and recommendations.
LIVE BETTER ELECTRICALLY
Collyer INSULATED WIRE CO.
245 Roosevelt Avenue • Pawtucket, R. I.

More Colored Bulbs

GE, Westinghouse unveil blues, greens, golds; see more decoration with light

Use of higher wattages, and the filling of more empty sockets is promised with new lines of pastel-tinted lamp bulbs just introduced by Westinghouse Electric Corp and General Electric Co.

Both firms, which along with Sylvania Electric Products, Inc, placed a highly successful pink lamp on the maket last year, are now branching out into more colors. Westinghouse's "Beauty Tone" line includes "candlelight" (gold-yellow) and "aqua" (blue-green) lamps in addition to pink. G.E. has added "spring green", "sky blue", and "sun gold" to round out its "Coloramic" series.

"In the past few years we have moved into a new era of color, said F. M. Sloan, Westinghouse Lamp Division's vice president. "Color has now been combined with light to give home lighting an emotional and esthetic appeal with the result that bulbs will be used for more than just light for seeing."

Redecorate For $1.50

"With these lamps it is now possible to bring about changes in color, atmosphere and seasonal effects," said Eugene W. Commery, G.E. home lighting expert. "For about $1.50 a homemaker can change the decor of her living room in the time it takes to change the light bulbs."

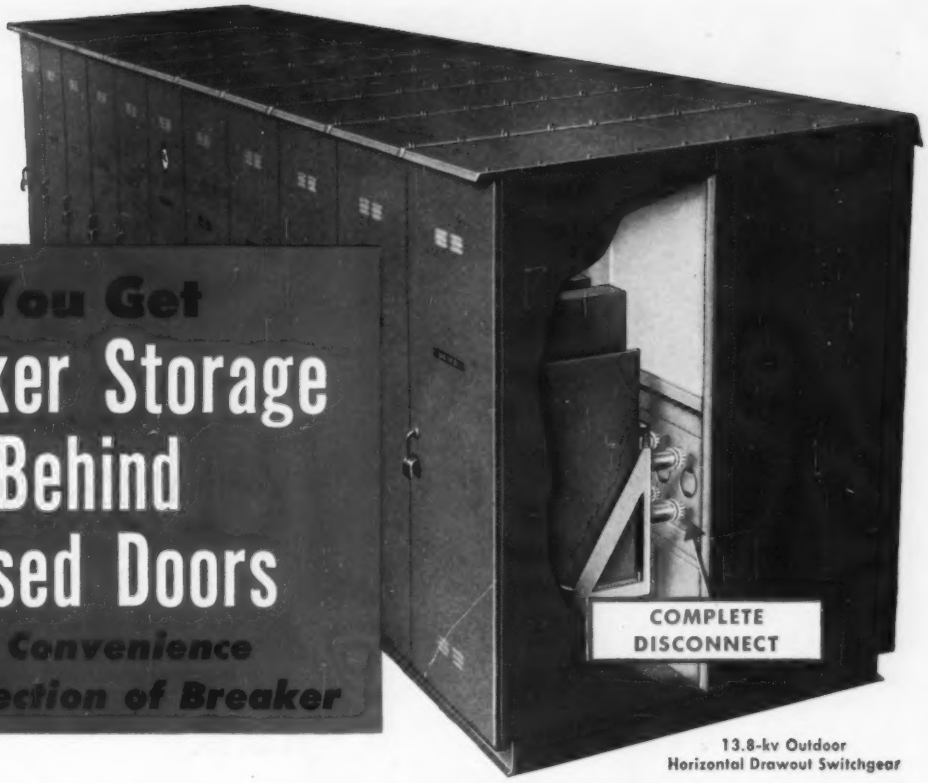
We have learned that there is more to lighting than lumens per watt, said Sloan. For years the industry thought only in terms of brightness and efficiency. Then the pink tinted light bulb was introduced and sales soared. By comparison, this pink bulb was not an efficient lamp. It did not give more lumens per watt; in fact, it gave a little less. But the public loved it.

Besides the home, both firms see big markets for the color bulbs in clubs, lounges, hotels, restaurants, etc.

G.E.'s "Coloramic" series will be available later this year, will retail for 29¢ for 75 and 100-watt sizes, and 32¢ for 150-w bulbs. Westinghouse's "Beauty Tones" will be available later this month in 60-, 75-, 100-, and 150-w sizes and in three-way wattages of 50-100-150 and 100-200-300.

You Get Breaker Storage Behind Closed Doors

for Convenience ... Protection of Breaker



13.8-kv Outdoor
Horizontal Drawout Switchgear

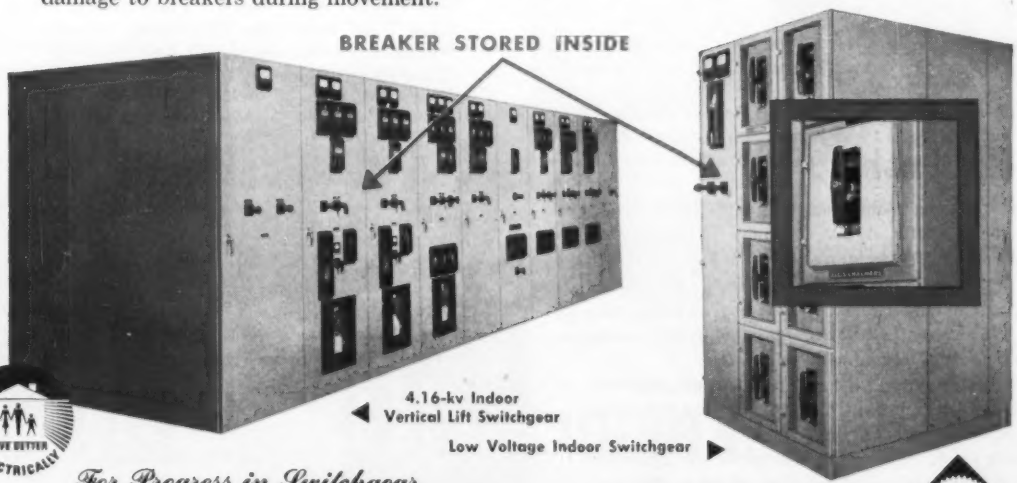
All types of Allis-Chalmers switchgear have provision for storage of fully disconnected breaker inside cubicle, with the door closed.

No special storage space is required for breakers not in use — simply disconnect the breaker and store it in its own cubicle.

This popular feature of A-C switchgear eliminates much handling and danger of damage to breakers during movement.

When breaker is in disconnected position, it is safely removed from primary and secondary contacts. Here it remains firmly fastened to withdrawal mechanism and can't move into unit accidentally.

This is only one of many features of Allis-Chalmers switchgear. For the complete story, call your nearby A-C office, or write concerning your problem to Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.



4.16-kv Indoor
Vertical Lift Switchgear

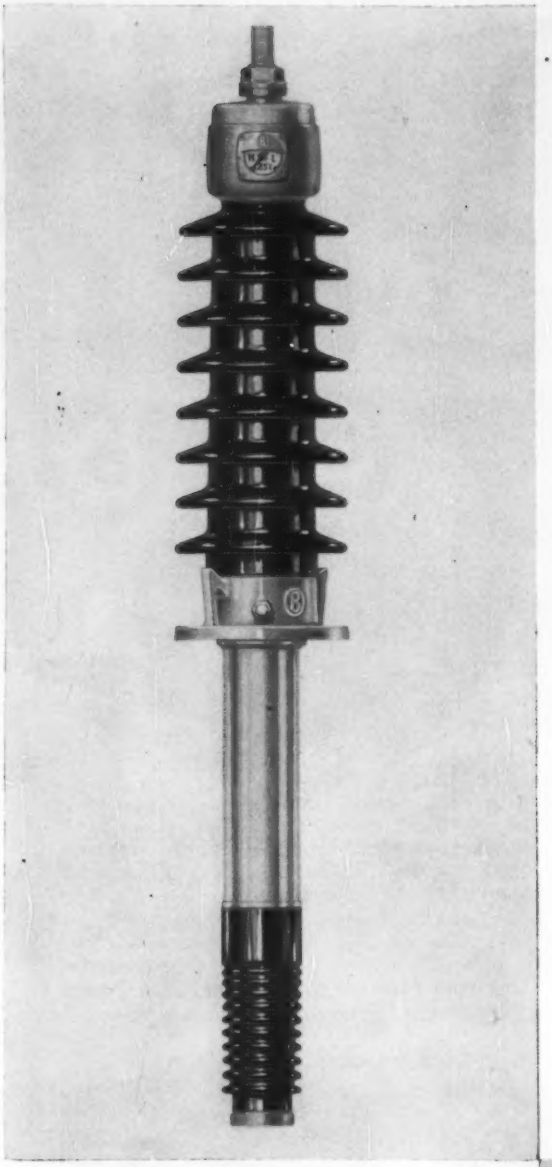
Low Voltage Indoor Switchgear

LIVE BETTER ELECTRICALLY

For Progress in Switchgear

ALLIS-CHALMERS

A-5083

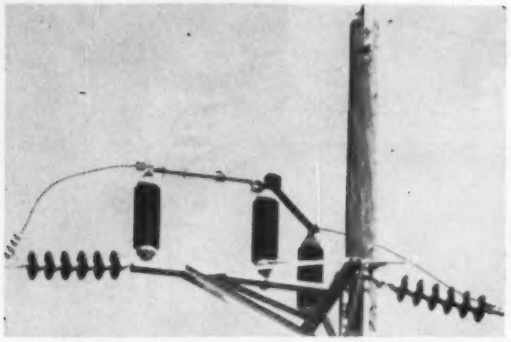


69-KV Bushing

Built to meet American Standards Association requirements, this 69-kv bushing is designated GK-30. Bushing's insulating core is of full-condenser type; its paper dielectric is reportedly completely oil-impregnated and oil-surrounded. One-piece porcelain housings at both ends provide core sealing and end to end oil-immersion.

A magnetic gauge on the oil expansion reservoir provides oil-level check. Core grounding to mounting flange is by an external tap, which has a removable protective cap. A spring compression assembly provides firm mechanical relation of parts. Bushing comes in solid and hollow conductor draw-lead types for oil levels of 16½, 21 and 27 in.

Ohio Brass Co, Mansfield, Ohio.



Vertically Stacked Switch

Designated TECO 1B, this vertically stacked, side break, 600-amp switch is rated 15 through 115 kv. Said to provide quick installation, it can be set on corner dead-ends and requires no additional real estate for switching structure.

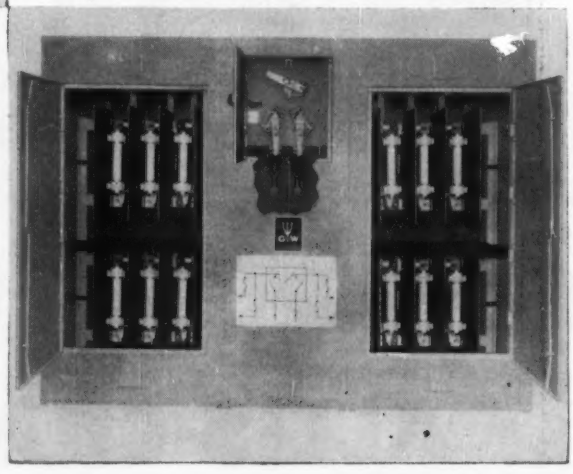
Features include direct line to load connections, back insulators dead-ended to pole bands, beryllium contacts and static wire protection.

Turner Electric Corp, 9510 St. Clair Ave, East St. Louis, Mo.

Load Break Switch

Designed for industrial h-v distribution centers, a 400-amp load break oil switch is said to provide flexibility for two feeds and four loads. It has three sets of manually operated links. Normally, upper set of links are open and two loads are supplied from each feeder separately. By opening either set of lower links and closing upper, four loads can be supplied by either feeder. Type SCRA, below, is rated 5 kv with high interrupting capacity fuses. Similar units available in 15 kv.

G&W Electric Specialty Co, 7780 Dante, Chicago, Ill.



new!

Sleet Hood, protective cover for silver plated phosphor bronze contact spring and guide plate. Closure and contact are simple and positive. Unaffected by weather. Hubbard design of guide plate and contact spring assures perfect closure action.

Complete terminal protection is provided by flexible snap-on bird guard through which a "lift" ring projects. Line attachment is by means of transformer type connector. Conductor may be snubbed through "lift" ring opening if desired.

New style, extra strong, insulated hanger. Coating provides bird and animal protection.

Specially designed small bore fuse tube for high pressure instantaneous single vent expulsion. Fibreglass reinforcement provides mechanical strength to handle maximum current interruption, with no increase in bore diameter—and no destructive results.

Load break fitting attachment holes—Load break fittings provide means for mechanically disrupting connection. Furnished extra.

Cam locking device which permits unobstructed removal of fuse holder when in the open position, in addition to locking holder against accidental removal the instant closure is begun. Spring actuated leverage arrangement puts tension on fuse link to aid in quick opening.

Locked recoil absorber bracket is provided to cushion recoil of discharge action. This prevents damage to the porcelain and mechanical assembly under stress of maximum current interruptions.

Hubbard Distribution Fuse Cutout!

Now from Hubbard a new heavy-duty fuse cutout that opens a new era in the protection of equipment on your distribution lines. Incorporating new electrical and mechanical designs, the new Hubbard Cutout offers tremendous operational flexibility with its ability to clear faults over the entire operating range from minimum to maximum available fault current. No longer will it be necessary to continually check available fault current values at many different points as your system is expanded. What's more, the need for shifting cutouts to handle changing fault current values will be drastically reduced.

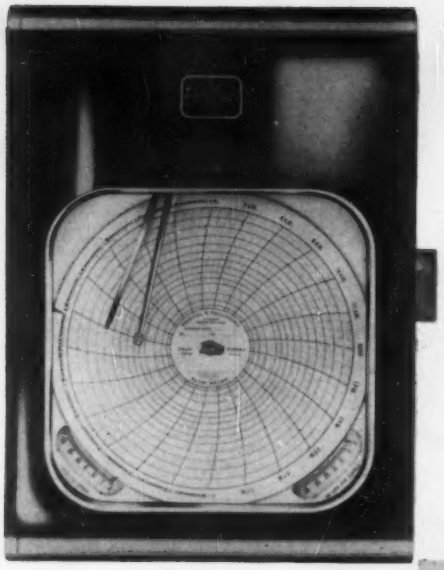
Heart of the new design is the small bore fibreglass reinforced, single vented fuse tube. By using a minimum inner diameter fuse tube and reinforcing it with fibreglass for maximum mechanical strength, Hubbard engineers were able to provide the positive expulsion action necessary for safe, sure, instantaneous arc interruption.

To support this greatly increased bursting action, entirely new high strength mechanical components were provided. There are no unnecessary or complicated parts in this new rugged simple design. Gas expulsion and fuse blowing are substantially completed before any parting of current carrying contacts. The entire current carrying circuit is composed of silver plated contacts of the pressure type. All springs are designed to act well below their elastic limits for maximum pressure maintenance throughout the life of the cutout. Positive closing is assured through the cam arrangement of the hinge mechanism which causes the fuse tube hinge to tighten as the fuse approaches the latched position.

Equipped with sleet, bird proofing and dead-end eye to meet local service conditions. Mechanical load break attachment can be specified as needed. Your Hubbard distributor will be glad to supply you with production samples. Call today, or write for a copy of Bulletin 756.

HUBBARD AND COMPANY

Pittsburgh 1, Pa.
Chicago 50, Ill.
Oakland 8, Calif.
Dallas (Plano), Texas



Pneumatic Controller

Features of a pneumatic controller are said to include high stability of control action without loss of stability, coupled with a wide proportional band of ½ to 400%.

Designated Series 500 Air Controller, it is designed to measure variables such as pressure, vacuum, temperature, liquid level, flow, differential pressure and mechanical motion. Control modes available include narrow band (on-off), proportional, reset, derivative and reset plus derivative. Cascade, selective and ratio control models are also available. Bulletin A130 is offered.

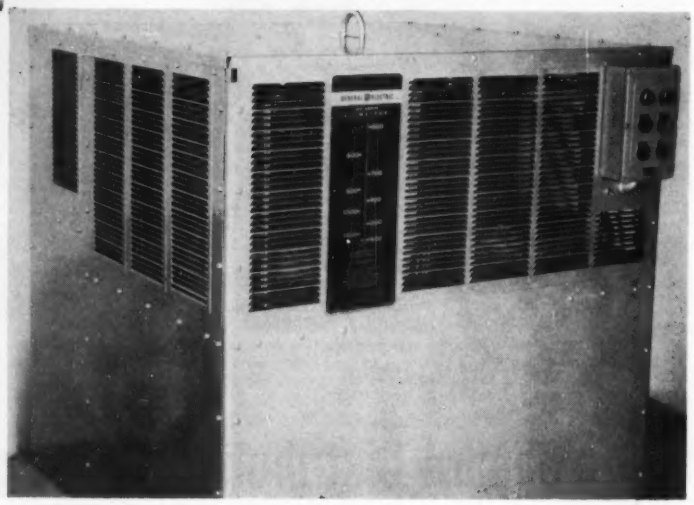
Bristol Co, Waterbury 20, Conn.

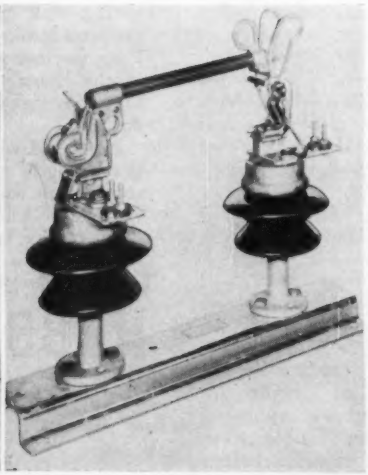
1,540-Amp Rectifier

A 1,540-amp rectifier power supply is rated for 100% duty cycle for the submerged arc process. It is designed for operation on a 3-phase 460 or 575-v input (not reconnectable). The unit reportedly has an actual output range of 600 to 1,600 amp and can be operated continuously.

Coils are rated for 130 C temperature rise. Open circuit voltage is 78 v, and at full load output, 40 v.

General Electric Co, Schenectady, N. Y.





100-Amp Cutouts

Two-insulator cutouts, rated 100 amp, 7.8 and 15 kv, are available with power class insulators for substation applications (right) or with distribution insulators for crossarms. They are said to accommodate interchangeable fuse cartridges with or without load break devices.

At 7.8 kv, interrupting ratings are 3,000, through 10,000 amp. At 15 kv, capacities are 2,000, 4,000 and 8,000 amp. Crossarm has EEI-NEMA hanger; substation, channel base.

Line Material Co, Milwaukee 1, Wis.

(*More New Equipment on page* 166)

where **POWER** is **VITAL**

ASCO AUTOMATIC TRANSFER SWITCHES help assure round-the-clock communications for Bell Telephone System

Each day millions of voices and scores of television and radio programs are flashed through some 50,000 miles of Bell System radio relay channels. Transmission through this vital chain of communications must be constant to meet the needs of a growing and busy America. That's why the Bell System has engineered complete safety and emergency features into many of its unmanned and often isolated radio relay stations.

Typical of these safety precautions are ASCO Transfer Switches which in case of failure of local power supply *automatically* transfer the load to an emergency power source.

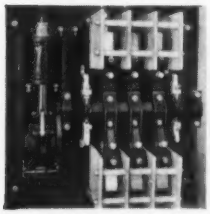
Dependable Control by ASCO

Where power and dependability are vital, ASCO switches give these signal design advantages: • **continuous duty rating** in either normal or emergency position • **capacity** to withstand inrush currents 20 times full load rating • **mechanical locking,** providing high contact pressure • **single coil design** • **built in time delay,** so that equipment ignores harmless momentary outages • **full phase protection,** and other design features.

For these reasons, many engineers today specify ASCO – the one source for a full line of dependable automatic transfer switches. *Write for Publication 596 describing how to select an adequate automatic transfer switch.*

Dependable Emergency Power

Here is the ASCO Transfer Switch installed at Bell's Plainview, L. I., radio relay station.

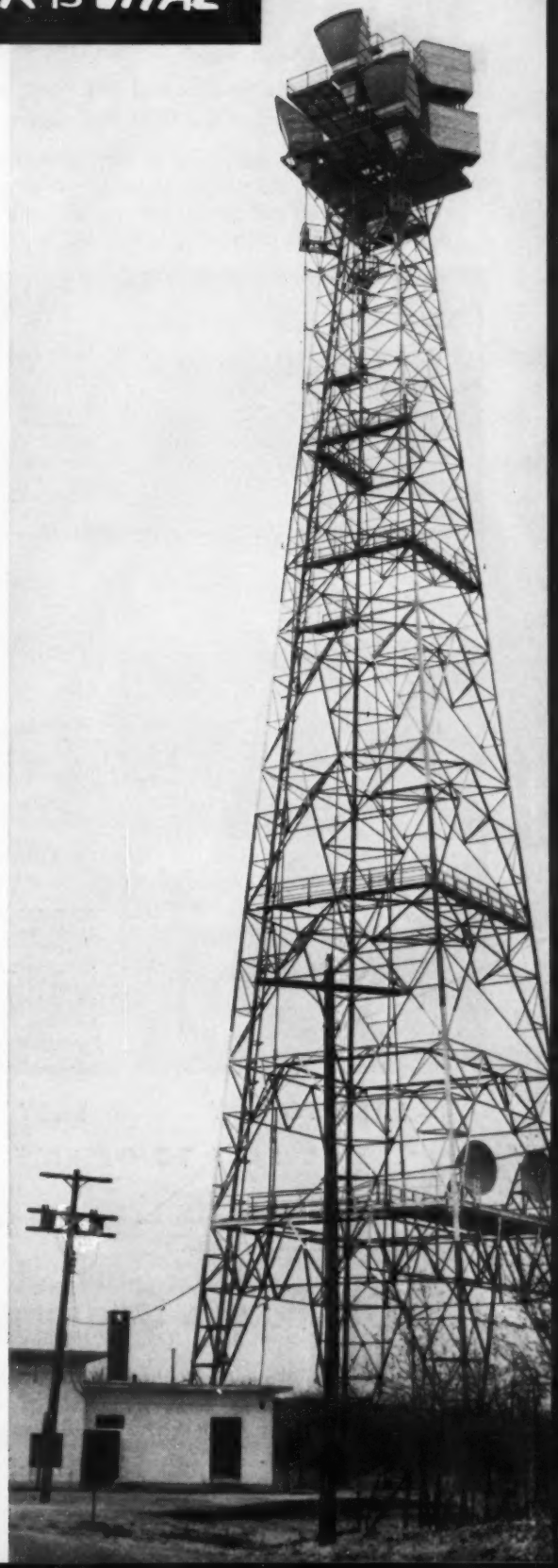


ASCO Automatic Transfer Switch – Bulletin 905. When normal power fails, this Switch transfers the load to the emergency source; the Switch will retransfer the load when normal is again in proper operating condition. Accessories permit delayed transfer to emergency and retransfer to normal in order to attain system stabilization before the selected source assumes the load.

Important announcement . . . *new ASCO plant now being built in Florham Park, N. J., will double production capacity and greatly extend the range of our research, product development and services.*

Automatic Switch Co.
397 Lakeside Avenue, Orange, N. J. • ORange 2-5300

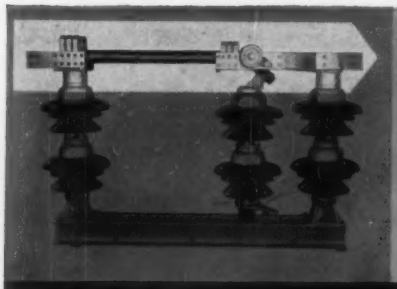
ASCO



USCO AIR-BREAK SWITCHES

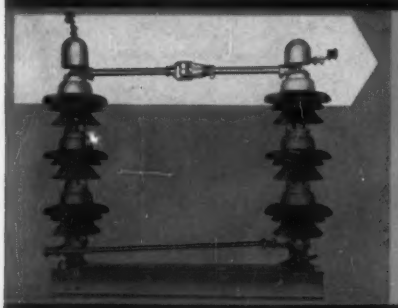
Official test data and actual field test prove the quality and sound design of USCO high-pressure contact switches!

These switches are test-proved to have all the desirable features and ability demanded for switchgear today. Compare these general construction features and specific test results. You'll see why USCO air-break switches are outstanding in the field.



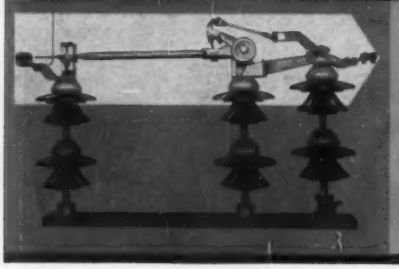
Official Test Results TYPE G-45

69 KV — 2000 amperes
79,000 RMS amperes momentary (5 cycle)
47,000 avg. RMS amps, 4-second duration
20° C rise on Heat-run
Available: 15-69KV, 2000-4000 amperes
(69KV, 2000 ampere shown)



Official Test Results TYPE GCH-1

69KV—1200 amperes
72,000 RMS amperes momentary (5 cycle)
44,000 avg. RMS amps, 4-second duration
20° C rise on Heat-run
Available: 15-115KV, 400-1200 amperes
(115KV, 600 ampere shown)



Official Test Results TYPE GT-22

69KV—1200 amperes
77,200 RMS amperes momentary (5 cycle)
40,000 avg. RMS amps, 4-second duration
24° C rise on Heat-run
Available: 7.5-230KV, 400-1200 amperes
(69KV, 1200 ampere shown)

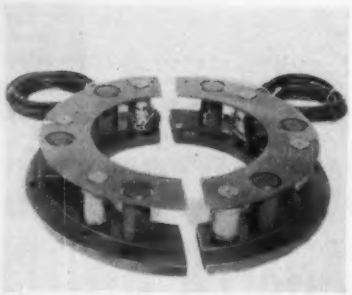
● EASY TO BUY ● EASY TO INSTALL
● EASY TO OPERATE

Your inquiries will receive prompt and courteous attention.
For full details write to us today.

USCO Power Equipment Corp.

829 North 36th Way, Birmingham 4, Alabama — Phone 59-7241

Designers and manufacturers of high voltage electrical equipment

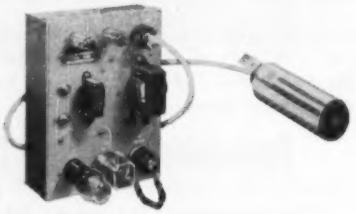


Measuring Gages for Shaft Thrust Loads

An electrical load measuring system for Kingsbury thrust bearings is designed for continuous, automatic supervision of thrust loads of steam turbine shafts. Resistance-wire strain gages incorporated in a special thrust element (installed as part of the Kingsbury bearing record) output on a Baldwin strip chart recorder. An alarm circuit warns of overloads in either direction on the shaft.

Units are designed for 100,000-lb load. Measurement accuracy is reportedly within 3%. Recorder response to load changes is 0.5 sec for full scale. Units are sized to specification.

Baldwin-Lima-Hamilton Corp, Electronics & Instrumentation Div, 806 Massachusetts Ave, Cambridge 39, Mass.

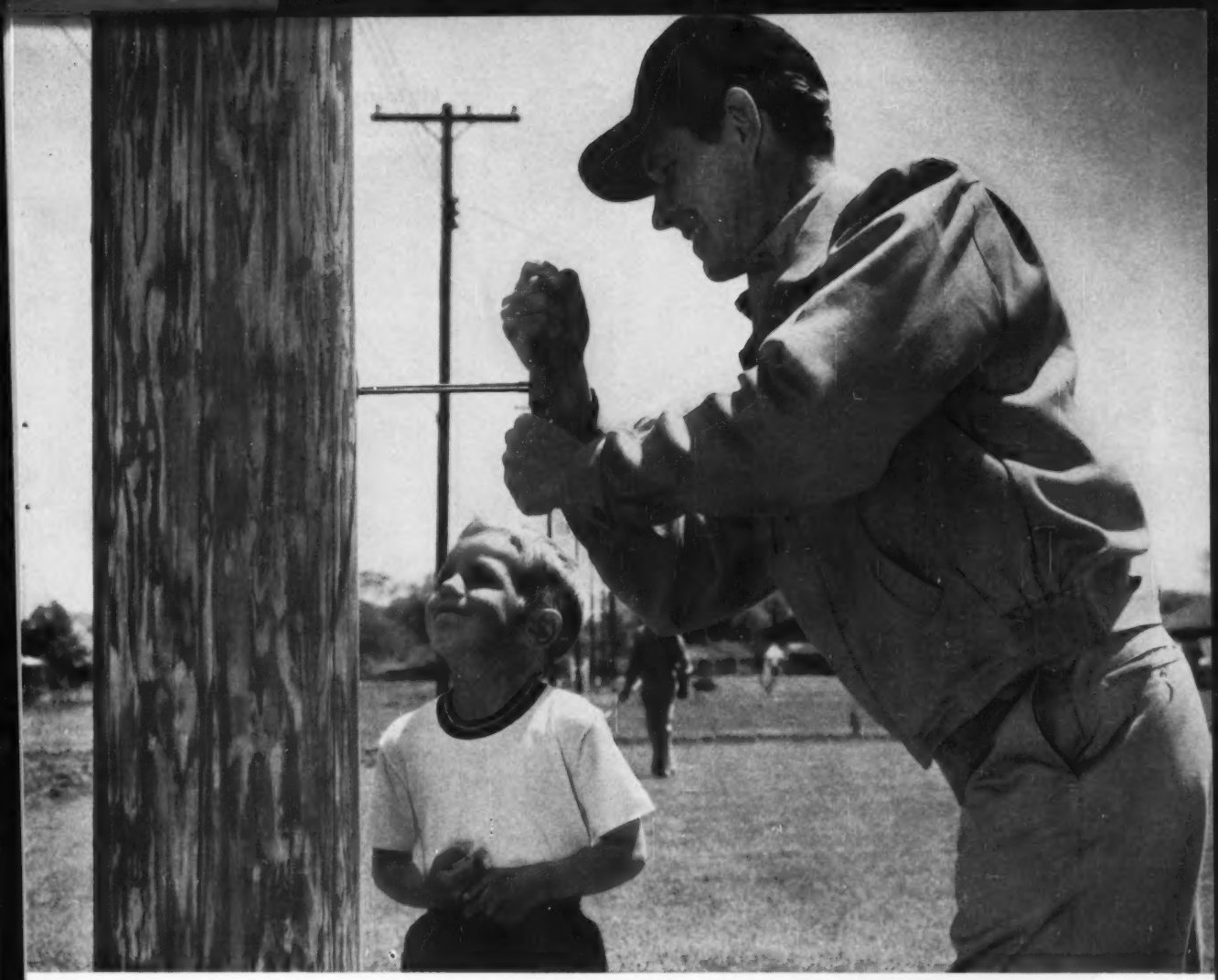


Limit Switch

This proximity limit switch converts mechanical position or motion into a signal without physical contact between a ferrous part and switch, manufacturer reports. It is available with relay output or tube output and may be used in 110-v control circuits. Large parts can reportedly be sensed at up to 1½ in. from transducer head and small parts at 1 in.

Square D C, 4041 N. Richards St, Milwaukee, Wis.

(*More New Equipment on page* 168)



well, sonny, this is the way we tell how long the pole will last

. . . and PENTA really makes 'em last!

When this youngster asked why we were drilling a hole in the pole, I knew the simplest answer I could give him would bring on another question . . . and it did.

Of course, it wouldn't be so tough to explain to another utility man why we drill holes in our poles. You see, my company protects all its poles with PENTAchlorophenol preservative. With PENTA, you can actually measure the amount of protection that's left in a pole at any particular time by analyzing borings taken from the pole.

That way, we know how well protected a pole is when we buy it, and we can check it anytime afterward to measure its remaining service life. Takes the guesswork out of maintenance and replacement planning for our company.

There are a lot of other reasons why we use PENTA-treated poles. Under any soil or climatic condition, they last for years and years. They're clean—present an attractive appearance, are easier to handle, install and climb.

You'd think all these PENTA advantages would cost quite a bit, but they don't. You can buy PENTA-treated poles for the same price you'd pay for poles treated with ordinary preservatives and you can get them from pole suppliers all over the country. Why not find out more about them? Write to THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. PE982A.

you can depend on DOW CHEMICALS

DOW

Now—"engineered" power

for switchgear-control —emergency lighting —auxiliary power

C&D PLASTICAL® and PLASTICELL® BATTERIES

Compact, modern-design "power plants" engineered for specific applications!
C & D PlastiCals and PlastiCells give you completely dependable power—
where power must not fail!

PlastiCal—with lead-calcium grids for maximum life—is conservatively engineered for at least 25 years in full-float service. PlastiCell—with high-tensile alloy grids—has a projected life of 14 years in float service.

WITH BOTH PLASTICAL AND PLASTICELL YOU GET SUCH ADVANCED C & D DESIGN EXTRAS AS:

1. Extra-long life—exclusive design combines advantages of both suspended and supported plate construction.
2. Triple insulation—thick Fiberglas mat, microporous separators, and perforated Koroseal retainer.
3. Saftee-Vent—outstanding C & D development that prevents accidental battery explosions.
4. Crystal-clear plastic jars—heat-resistant and hermetically sealed.
5. Plastite Post Seals—for easier maintenance, and at the lowest lifetime cost.

Write for C & D Specification Bulletins:
CP-536 Rev. 1 on PlastiCal Batteries
CP-537 Rev. 1 on PlastiCell Batteries

C&D BATTERIES, INC.
of Conshohocken, Pa.
Industrial Batteries since 1906

SALES AND SERVICE OFFICES IN PRINCIPAL CITIES FROM COAST TO COAST

Lighting Control

Known as Mark V, this sealed cartridge photoelectric lighting control is said to provide sensitive, positive control of any system which should be coordinated with outdoor light conditions. It features climate and dirt-resistant plastic enclosure and break-resistant dome.

Device can be adjusted to turn lights on over range of ½ to 10 ft-c and off at about ¾ ft-c higher. It can be supplied with time-delay circuit to avoid operation from temporary light changes.

Unit is said to provide automatic control for tungsten, sodium vapor or mercury vapor.

Tuttle & Bailey, New Britain, Conn.

V-8 Diesel Engine

A Deutz V-8 air-cooled diesel engine is incorporated in 32,000 through 40,000-lb four-wheel-drive trucks and 36,000 through 40,000-lb six-wheel-drive units. The engine's 170 net hp rating, high torque range, and an axial flow blower which eliminates use of liquid coolant are said to make it adaptable to heavy-duty trucks in utility, construction, road maintenance and other fields.

The engine has individually interchangeable cylinders and heads. Designated F8L614, it has a 4.33-in. bore, 5.51-in. stroke, 640-in. piston displacement, and maximum torque of 448 lb-ft at 1,200 rpm.

Four Wheel Drive Auto Co, Clintonville, Wis.

(*More New Equipment on page* 170)

VICTOR PROGRESS REPORT #4

We use BLACK LIGHT to certify soundness of

VICTOR
INSULATORS!

Soundness of insulator porcelain is of utmost importance to every power man. Tiny imperfections, too small for detection by eye alone, can bring about costly failure and interruption of service. VICTOR certifies the soundness of porcelain insulator bodies by the use of "black light." Before firing, insulators are sprayed with a fluorescent material, then subjected to a near ultra-violet light. This process detects the slightest imperfection in the body mass for subsequent rejection. It assures you of sound, perfect insulators, cuts costs, minimizes replacements, safeguards service. Another reason why VICTOR produces the best insulators that money can buy!

"BETTER INSULATORS THROUGH RESEARCH"

SPECIFY VICTOR

Purified Porcelain Insulators!

VICTOR INSULATORS DIVISION
I-T-E CIRCUIT BREAKER CO.
VICTOR, N. Y.

Low and High Voltage Pintypes • Suspensions • Guy Strains
Spools • Switch and Bus Insulators • Custom Designed Porcelain Insulator Hardware

Subox paints assure economy and protection that no other paint can give: they are made with *suboxide of lead*—the only paints in America made to an exclusive Swiss-developed formula.

Suboxide of lead is one of the most effective anti-corrosive agents known. Furthermore, it is a heavy colloidal pigment that spreads extremely smoothly, evenly, thoroughly; adheres closely and endures for many years.

Subox* and Subalox* paints deflect external heat and radiate internal heat; thereby keeping metal surfaces cooler. This Subox quality gives transformers, plants, and sub-station equipment maximum protection plus operational efficiency.

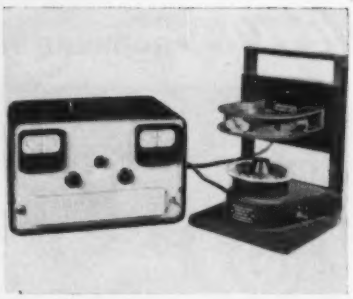
Easily applied by brush, spray or flow-coating, Subox paints save you money now and during the future. Send for booklet *"Corrosion Control of Electrical Structures and Equipment."*

Established 1924
3 Fairmount Plant, Hackensack, N. J.

Subox Inc.

See Catalogues in Sweet's Industrial and Engineering Files

*Trade Mark

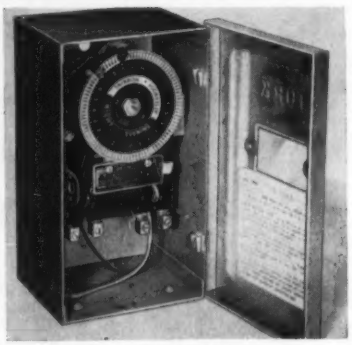


Rotor Balancer

Described as suitable for laboratory and production line balancing, this rotor balancer has applications on motors and turbines, high-speed grinding heads and gyroscopes. Speed indication is provided in two ranges, 0 to 20,000 rpm or 0 to 200,000 rpm.

The electronic computer unit computes magnitude of required corrections in any two correction planes selected, manufacturer claims. Corrections are made by removing or adding mass at designated positions with drilling unit or equivalent means.

M. Ten Bosch, Inc, Pleasantville, N. Y.



Time Switches

Series of double-pole, double-throw times switches feature heavy-duty capacity. Applications include transfer from one circuit to another, control of mechanically-held contactors or motorized valves, and alternation from a high to a low heating control.

Top contacts are rated 30 amp, 3 kw (incandescent lamp load rating), 1 hp, 345 va at 120/240 v ac. Bottom contacts rated 15 amp, 1.5 kw, ½ hp, 175 va at 120/240 v ac. Unit is available in 24-hr on-off dial, astronomic, "skip-a-day," and 7-day timing.

Tork Clock Co, Mount Vernon, N. Y.

(*More New Equipment on page* 174)

PORCELAIN PRODUCTS INSULATORS

P.P. #66200 - 6" - Strain Insulators
EEI-NEMA CLASS 52-1

PREFERRED

BY THE MEN WHO INSTALL THEM

...because they've got MORE ROOM to work in, get the job done easier—faster—safer.

There's MORE WORKING SPACE between the skirt of the insulator and the clevis pin—plus—an EXTRA LONG CLEVIS PIN for ease of handling during routine construction—a must for Hot Line applications.

Minimize YOUR interruptions of service the PREFERRED way — Specify PORCELAIN PRODUCTS, INC. #66200.

PP INC.

Porcelain Products, Inc.
High Voltage Division **Parkersburg, W. Va.**

Now, *quality*

high-voltage cable at less cost:
with **new RoZone-RoSeal**

Superior moisture resistance compared to other types of nonmetallic sheaths: That's just one advantage of RoSeal, Rome Cable's new special thermoplastic sheath for shielded power cable rated up to 15 KV.

In its new RoSeal, Rome has perfected a sheathing material which better fulfills all requirements for a shielded power cable sheath, eliminates many disadvantages of other sheathing materials, *and* reduces cable cost.

In the case of RoZone-RoSeal cable, the new RoSeal sheath is applied over Rome's premium quality oil-base type insulation, RoZone. Thus, the new RoSeal sheath, combined with time-proven RoZone insulation, offers seven other advantages, in addition to its outstanding moisture resistance.

1. The coefficient of friction of RoSeal is considerably lower than other sheathing materials. This makes it much easier to pull in ducts or conduit.
2. RoSeal is easier to bend and install at subzero temperatures. Minimum recommended installation temperature is −40°C.
3. RoSeal has proved satisfactory for *both* underground and overhead use.
4. RoSeal is durable and long lasting —has a life expectancy at least equivalent to polychloroprene sheath.
5. RoSeal is flame resisting.
6. RoSeal provides a rugged mechanical barrier. Its tensile strength, hardness and other mechanical properties are designed for the job.
7. RoSeal is resistant to microorganism attack. Its resistance to weathering and soil conditions is also equal to that of polychloroprene sheaths.

Electrical tests made in the Rome laboratories show uniformly higher corona level and dielectric strength for RoSeal jacketed power cables.

RoSeal has particularly high resistance to oils and most chemicals, making it especially adaptable for installation in chemical plants, refineries, paper mills, steel mills and the like.

We invite you to prove for yourself the value of RoSeal. Write today for a sample of RoZone-insulated, RoSeal-sheathed power cable. You'll find it's everything we have stated here.

It Costs Less to Buy the Best

ROME CABLE CORP. ROME, N.Y.

ROME CABLE
Corporation
ROME · NEW YORK
and
TORRANCE · CALIFORNIA

FLINT STEEL

The completely integrated facilities and personnel of Flint's two conveniently located steel plants enables Flint to provide personalized services of engineering, estimating, detailing and fabricating.

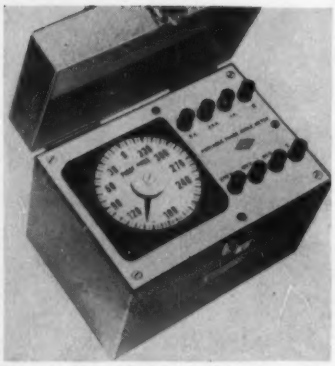
Flint invites your inquiries and requests for consultation. For information contact either plant.

FABRICATED GALVANIZED STEEL
FABRICATED STRUCTURAL STEEL
FABRICATED STEEL PLATE
FABRICATED REINFORCING STEEL
STEEL WAREHOUSE DISTRIBUTORS

for over 40 years

FLINT STEEL CORPORATION

TULSA . . . MEMPHIS



Phase Angle Meter

A portable phase angle meter is self contained and requires no auxiliary equipment for operation, according to manufacturer. It is said to offer a direct way of checking relay and instrument connections, particularly directional over-current and differential relays. It also measures power factor in each phase of poly-phase watt-hour meter.

Frequency is 60 cycle and voltage range is 60, 120 and 240. Current ranges for the 9½ x 6¾ x 5⅝-in. meter are 1, 2½ and 5 amp.
Eastern Specialty Co, Phila 40, Pa.

Rotary Compressor

Addition of an 85 cfm size to line of portable rotary compressors has been announced by manufacturer. Called Gyro-Flo 85, the unit weighs 1,840 lb, height is 42 in. For truck mounting, weight is 1,375 lb.

Compressor is driven by 4-cyl, 4-cycle, "L" head engine, which features push-button starting, individual porting and a 6-v battery system.
Ingersoll-Rand, 11 Broadway, New York 4, N. Y.

200-Amp Switch

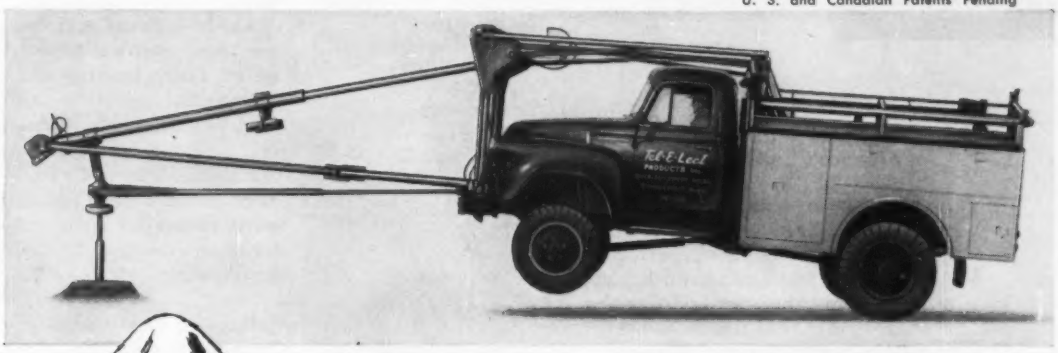
A 200-amp switch, designated as Raintight, is designed to control and protect the two separate 100-amp main lines to farm homes and barns by two 100-amp "Renu-Fuse" pullcover assemblies. It is available with one 100-amp pullcover and single 60 and 30-amp pullcovers.
Wadsworth Electric Mfg Co, Covington, Ky.

(More New Products on page 176)

TEL-E-LECT Hydraulic Derrick

packs enough down pressure to lift a truck!

U. S. and Canadian Patents Pending



NOW...LIFT FULL CAPACITY LOADS FROM THE GROUND UP

HERE'S THE QUICK MODERN WAY to dig holes and set poles . . . *hydraulically!* Actual experience in the field has resulted in the development of derricks designed to do—not just all of the ordinary jobs—but many others that could not be done before. Tel-E-Lect's hydraulic derricks open up an entirely new field of time-and-money-saving methods for pole line construction and maintenance work. They are ruggedly constructed to handle the greatest variety of public utility jobs economically.

IT'S SAFE . . . A single, double-acting hydraulic cylinder, protected by safety valves, operates the derrick from a stored position to one below the ground level. One lever controls the derrick through its complete cycle . . . nothing to assemble.

IT'S AUTOMATIC . . . Both digging and pole setting can be done without removing the digger. The digger and derrick store overhead automatically. Derrick legs automatically lock in the working position.

IT'S PORTABLE PRESSURE DIGGING . . . Imagine the ability to dig holes up hills . . . down into ditches . . . across obstacles . . . with the weight of the truck and full hydraulic thrust placed on the digger attached to the end of the derrick! Just move a single lever and you get *pressure digging* for any job.

All this is offered in 3 complete "packages" for front or rear mounting. *For additional information on hydraulic derricks and diggers . . . write for Bulletin H866.*

TEL-E-LECT PRODUCTS, INC.
10003 Minnetonka Blvd.
Minneapolis 26, Minn.

MR. DISTRIBUTION ENGINEER:

WHAT DO YOU KNOW ABOUT RT&E?

As one of the important men who distribute power to America, you should know something about one of America's leading suppliers of power equipment.

While we are not the largest transformer builder, you should know that we are one of the most reliable. Since economical performance and dependability are what *you* require, you will be interested in knowing that our transformers have been laboratory and field-tested and proved to meet every requirement of rugged service.

To back up what we say, our transformers are guaranteed for five full years of service. Our losses have been reduced to increase efficiency, improve regulation and raise overload capacity. Our externally operated tap changer is standard equipment at no extra cost.

These and other exclusive features have been developed from your suggestions. RT&E makes transformers the way *you* want them made.

RT&E CORPORATION
WAUKESHA, WISCONSIN

Equipment to help provide power for America

More New Products

General Electric Co, Schenectady 5, N. Y., has announced **rapid-start ballasts** for recently introduced Power lamps. The lamps have fluorescent tubes which doubles light output, GE says.

Keuffel & Esser Co, Hoboken, N. J., has added **electrical symbol template** to its Leroy lettering and symbol-drawing equipment. It conforms to ASA revision, comes in three sizes.

American Blower Corp, Detroit 32, Mich., is marketing a line of packaged **water chillers** for air conditioning or industrial cooling in 20 through 150-ton capacities.

Hogg & Davis, 2590 E 67th St, Long Beach, Calif., has devised a pole **"pul-bar"** for single pole hauling.

Permacel Tape Corp, New Brunswick, N. J., offers **film tape** No. 421 designed for Class H insulation applications. Available in ¼ through 6-in. widths and 36-ft rolls, it is nonflammable.

General Electric Co, Schenectady 5, N. Y., has Type AP-12 (ac/dc) portable **indicating instruments** which require less power from measured circuits than a prior model.

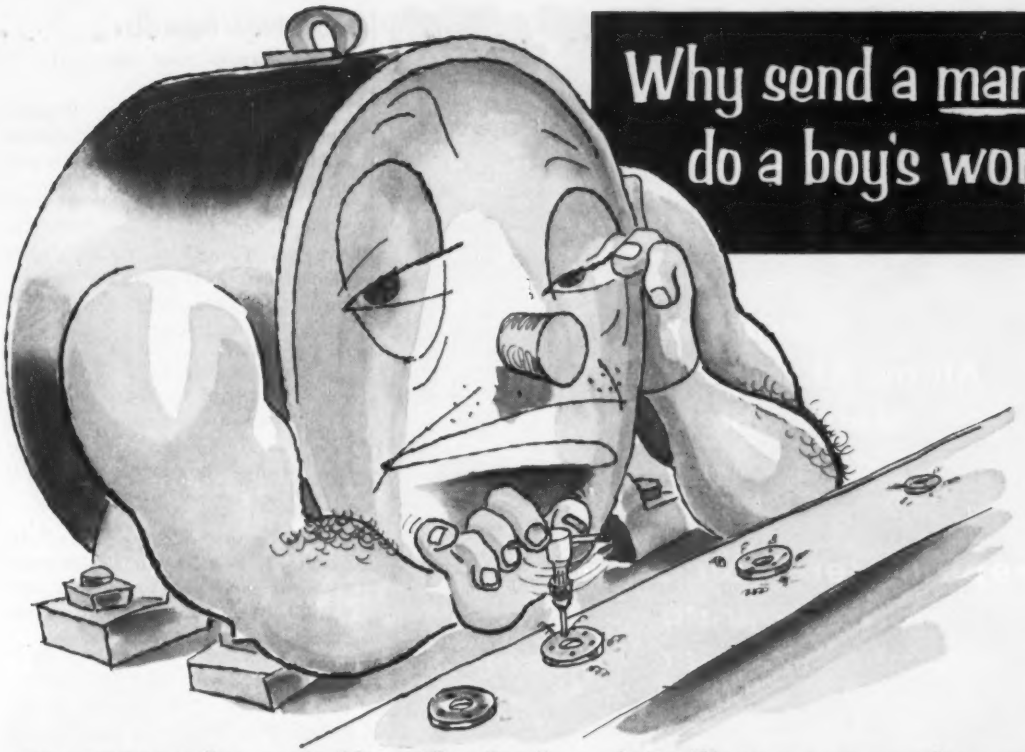
T. J. Cope, Inc, Collegeville, Pa., offers **ground tent** measuring 6 2/3 ft sq and 6½ ft high which utilizes 10-oz Army duck.

General Electric Co, Schenectady 5, N. Y., give the birds a break with a **line and bushing guard** that lets them perch on rural distribution transformers without short-circuiting primary lead to ground tank.

Automatic Switch Co, 391 Lakeside Ave, Orange, N. J., offers pilot-operated **solenoid valve** for automatic control of heavy fuels to large rotary and high-pressure atomizing burners.

Minnesota Mining & Mfg Co, Dept D6-173, St. Paul, Minn., has flexible epoxy **insulating resin** for production line casting of coils and other electrical components. It is designated "Scotchcast" No. CRP 235.

(More New Products on Page 178)



Why send a man to do a boy's work?

save money by matching the load . . . let silicones carry the overload!

You get a service factor ranging up to 50% with Dow Corning Silicone insulated (Class H) motors compared to 15% for Class A.

This built-in service factor saves you the initial cost of installing oversized motors to withstand the heat generated in reversing service, for example. In many applications, it saves the cost of over-motoring to carry intermittent overloads, or loads that can't be matched in standard frame sizes.

And eliminating the need for over-motoring gives you a better power factor and higher efficiency, because the smaller silicone insulated motors come closer to operating at full load most of the time.

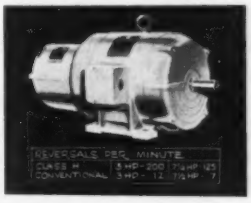
You also get more reliable service because motors insulated with Dow Corning silicones have superior resistance to heat, to a combination of heat and moisture, and to corrosive atmospheres.

Remember over-motoring is outmoded

to help you speed up production

LOUIS ALLIS

The Louis Allis Co. of Milwaukee has developed a line of rapid reversing motors which are silicone insulated and blower cooled to give a maximum number of reversals. A 3 hp Class H motor, for example, will do 200 idle reversals per minute compared to 12 for a conventional motor of the same frame size. A 7½ hp silicone insulated motor will do 125 idle reversals per minute compared to 7 for a conventional motor. These motors offer new production economies in any operation where high reversal capacity is required.



Dow Corning Corporation, Dept. 4408-A, Midland, Mich.

Please send me sources of supply for new Silicone (Class H) ☐ Motors ☐ Transformers

☐ Information on Louis Allis motors for rapid reversing service

NAME _____ TITLE _____

COMPANY _____

STREET _____

CITY _____ ZONE _____ STATE _____

DOW CORNING SILICONES

DOW CORNING CORPORATION
MIDLAND, MICHIGAN

ATLANTA • CHICAGO • CLEVELAND • DALLAS • DETROIT
LOS ANGELES • NEW YORK • WASHINGTON, D. C. (Silver Spring, Md.)

CANADA: Dow Corning Silicones Ltd., Toronto
GREAT BRITAIN: Midland Silicones Ltd., London
FRANCE: St. Gobain, Paris

Lightning insurance
With an Alcoa Aluminum Meter Shield
Keeps meters much more accurate and much cooler
for about 50¢
LIBERTY
IN GOD WE TRUST

Alcoa® Aluminum meter shields protect damping magnets against damaging lightning surges that cause pre-1946 watt-hour meters to run fast.

They keep meters up to 50° F cooler, too . . . especially important with delicate demand meters. Other important benefits are physical protection and improved appearance.

Typically, it costs a utility about $5.00 to repair a demagnetized meter. With an Alcoa meter shield in action at a cost of about 50¢, that's five dollars saved.

For full information and prices, contact your nearby Alcoa sales office or write Aluminum Company of America, 2308-V Alcoa Building, Pittsburgh 19, Pennsylvania.

THE ALCOA HOUR
TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS

Your Guide to the Best in Aluminum Value

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

More New Products

(*Continued from page* 176)

Beaver Pipe Tools, Inc, Warren, Ohio, offers a mobile abrasive **cutting machine** that cuts up to 6-in. pipe and up to 2½-in solids, weighs 800 lb.

Remington Rand Corp, 315 4th Ave, New York 10, N. Y., has a 13-lb **photocopier** that produces full-size copies of records written, typed or printed on any material.

Bailey Meter Co, 1050 Ivanhoe Road, Cleveland 10, Ohio, offers line of high-head **differential pressure transmitters,** utilizing mercury U-tubes, that automatically converts differential pressure to rate of flow.

Hagan Corp, 323 4th Ave, Pittsburgh 22, Pa., has an electro-pneumatic **ac controller** to measure and control current to motors or other circuits.

Bentley, Harris Mfg Co, Conshohocken, Pa., offers line of Teflon-coated, glass fiber **lacing tape** for wire harnessings and windings with a temperature range from below —100 F to 500 F.

Clark Controller Co, 1146 E. 152nd St, Cleveland 10, Ohio, has **service entrance switch** with four 240-v branch pullouts and a 100-amp main pullout plus eight plug fuse circuits.

General Electric Co, Schenectady 5, N. Y., has **shaded-pole motor** designed for window fans, 1/15 through ⅛-hp, with positive reversible feature.

Georator Corp, Manassas, Va., offers **360-cycle converters** that powers industrial tools at 5 kva, 220 v, 3 phase.

Arrow-Hart & Hegeman Electric Co, Hartford, Conn., has line of 20-amp grounding type **receptacles** and **caps** rated 125 and 277 v.

Glastic Corp, 4321 Glenridge Road, Cleveland 21, Ohio, offers flexible glass-mat polyester **plastic insulation** in $\frac{3}{32}$, $\frac{1}{16}$ and $\frac{1}{8}$-in thicknesses, up to 36 x 72-in sheet sizes.

Motorola, Inc, 4501 W. August Blvd, Chicago 51, Ill., has mobile two-way **radio** rated at 100 w transmitter power output on any channel in 25-54 megacycle frequency band.

Now there's a form of G-E silicone insulation for almost every insulating purpose!

Silicone impregnating varnish
Silicone-bonded mica tapes
Silicone-bonded wrapper and sheet insulation
WHICH OF THESE CAN HELP YOU MOST?
Silicone insulation for heavy-duty motor coils
Silicone-bonded mica tubes, cones, coil forms and segments
Silicone rubber insulated wire and cable

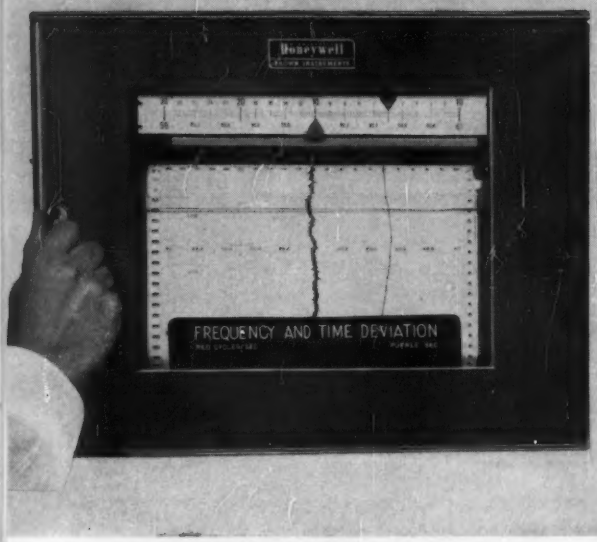
Insulating components made with General Electric silicones offer many advantages! G-E silicone resins and rubber-compound products not only provide Class H insulation but uprate Class B equipment to new performance standards. They offer a chance to design smaller, lighter units... build in better protection against overloads and moisture. Initial costs "disappear" when you consider how General Electric silicone insulation extends the operating life of electrical equipment!

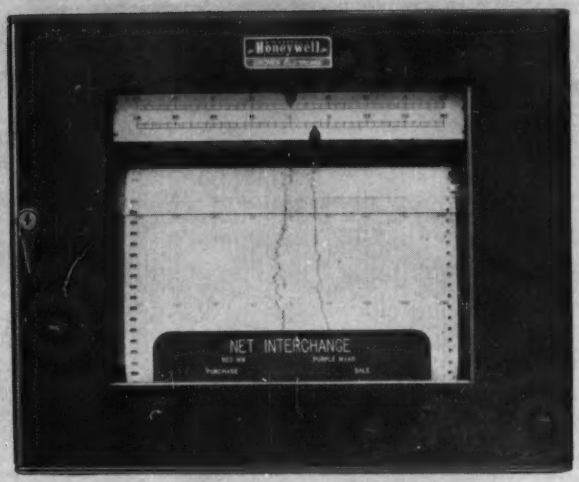
Substantial savings can be realized: Lower maintenance costs from greatly increased service life . . . freedom from down time . . . less materials through more compact designs. You'll find it pays to request *insulation made with G-E silicones.* For more information, write to:

SILICONE PRODUCTS DEPARTMENT
GENERAL ELECTRIC COMPANY
Section 62-2C, WATERFORD, NEW YORK
In CANADA, write to Canadian General Electric Company, Ltd., Toronto

Progress Is Our Most Important Product

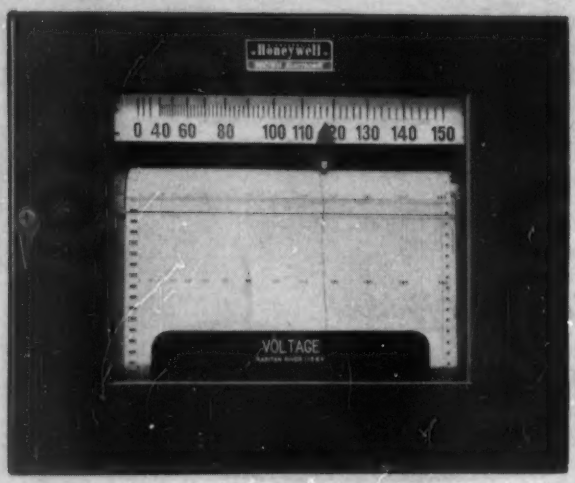
GENERAL ELECTRIC

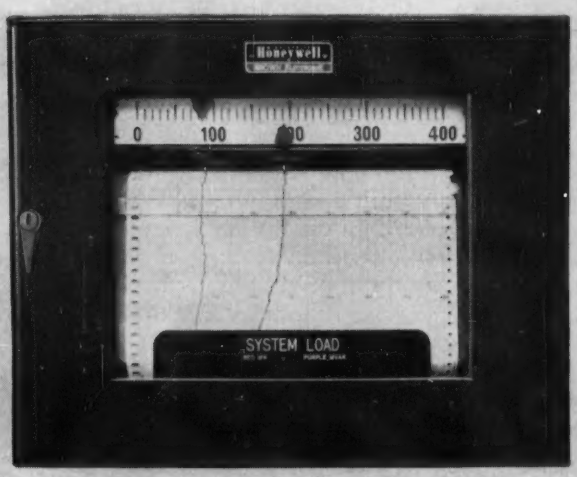




ElectroniK instruments can record . . .

- system load
- net interchange
- voltage
- frequency
- time deviation
- total generation
- station generation
- tie line loads
- sky illumination
- outside air temperature
- outside humidity
- wind velocity
- wind direction





Data recording instruments . . . to deliver dependably the facts your dispatcher needs

WHAT are the facts that your dispatcher should know, to keep up with what's going on in your system?

Variables important to him are listed on opposite page. *ElectroniK* instruments record and indicate these variables with the precision, speed and sensitivity that you've come to expect of Honeywell instruments . . . plus the dependability that you demand of all your equipment.

Your maintenance men will rarely have to perform more than periodic preventive service when *ElectroniK* instruments are at work. Every component is engineered for continuous service, with ample extra ruggedness. You can depend on *ElectroniK* instruments to deliver uninterrupted performance week after week. They have a reputation for staying on the job, in dispatchers' offices, power stations and in thousands of industrial plants.

Ask your local Honeywell field engineer to talk over the ways you can use these instruments in your own system. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

● REFERENCE DATA: Write for Bulletin 9070, "Instruments for Electrical Power Generation."

MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

First in Controls

GUY STRAND HOLDER

Safe

Handling of Guy Strands and Conductors

- Safest, easiest, most economical method of handling strand.
- Once strand has been placed in holder it CANNOT get out of control.
- No assistant required at holder when strand length is drawn out.
- No wire bindings or tapings required to retain complete control.
- Ideal for handling large, high strength strand.
- Readily carried to location, or can be bracket mounted on truck.

For further information write for Bulletin PH11A

MALLEABLE IRON FITTINGS COMPANY

POLE HARDWARE DIVISION

Branford, Connecticut

Representatives: William J. Cottrell Co., Portland, Ore. • James H. Drew Corp., Indianapolis, Ind. • Industrial Engr. & Equip. Corp., Los Angeles, Cal. • JSG Electric Co., Chicago, Ill. • Lee-Smith Co., Miami, Fla. • B. H. McCoin, Knoxville, Tenn. • William J. O'Brien, Memphis, Tenn. • Robert P. Smith & Co., Jacksonville, Fla. • E. A. Thornwell, Inc., Atlanta, Ga. • J. P. Voight, Summerville, S. C. • Waltham, DeWitt & Krusi, San Francisco, Cal. • L. G. Wendegatz, Kansas City, Mo. • Williamson Sales Co., Shreveport and New Orleans, La.; Dallas, Houston, Tex.; Pine Bluff, Ark. • O. C. Witte Co., Detroit, Mich. In Canada: Line & Cable Accessories, Ltd., Toronto

CATALOGS—BULLETINS

• **OUTDOOR LIGHTING:** Bulletin GEA-6438, 12 pages, defines basic terms for laymen and provides guide for planning outdoor lighting installations. Typical jobs are shown and a preliminary planning table is included. General Electric Co, Schenectady 5, N. Y.

• **REHEAT:** Evolution of manufacturer's reheat turbine designs in past 25 years, including installation photos and cross section drawings is described in Catalog 03R8467, 8 pages. Allis-Chalmers Mfg Co, 932 S. 70th St, Milwaukee, Wis.

• **LOAD CENTER TRANSFORMERS:** Features, typical applications, available ratings, core and coil assemblies offered and engineering data of line of load center transformers are given in Bulletin CS-1000, 12 pages. Kuhlman Electric Co, Bay City, Mich.

• **CONTROL PANELS:** Product Specification G71-7, 16 pages, describes six instrument and control panel designs and accessory equipment. Bailey Meter Co, 1050 Ivanhoe Road, Cleveland 10, Ohio.

• **H-V CABLE TAPING:** Arc-proofing technique for h-v cables using impregnated asbestos tape is described in 4-page booklet on manufacturer's No. 7000 treated tape. Minnesota Mining & Mfg Co, Irvington Div, 6 Argyle Terrace, Irvington, N. J.

• **CABLE TROUGH:** Bulletin 256-F, 12 pages, describes features, design data and specifications of cable trough and cable holding accessories. P-W Industries, Inc, Duncan & Melrose Sts, Phila. 24, Pa.

• **PLASTIC COUPLINGS:** Installation jobs where plastic couplings for transite ducts were used are shown and described in 4-page folder. Johns-Manville, 22 E. 40th St, New York 16, N. Y.

• **FLOODLIGHTING:** Bulletin GEA-6437, 8 pages, illustrates methods of architectural floodlighting and includes a recommended ft-c table. General Electric Co, Schenectady 5, N. Y.

• **VOLTAGE STABILIZING:** Features, application, and specification chart are included in 12-page bulletin (GED-2987) on voltage stabilizing transformers. General Electric Co, Schenectady 5, N. Y.

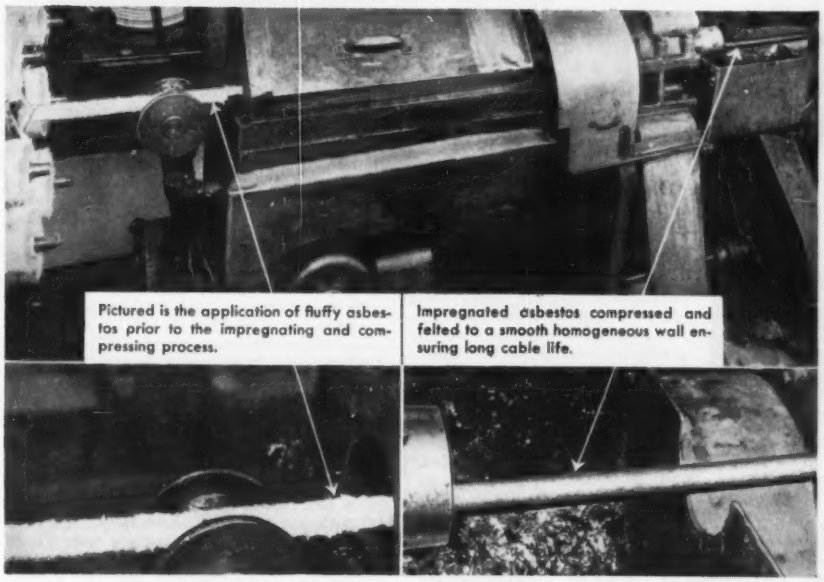
• **TRUCKS:** Catalog CR-674-F, 20 pages, presents design and operating features of four-wheel conventional and cab-over heavy duty trucks with 6-cyl engines. Gas, liquefied petroleum gas and diesel-powered models are covered. International Harvester Co, 180 N. Michigan Ave, Chicago 1, Ill.

• **LARGE CIRCUIT BREAKERS:** Ratings, features and descriptions of large air and heavy duty dc circuit breakers are given in Bulletin 1004-A, 6 pages. I-T-E Circuit Breaker Co, 19th & Hamilton Sts, Phila. 30, Pa.

• **CONTACT PROTECTION:** Operation, uses and advantages of selenium contact protectors are explained in "The A-B-C's of Contact Protection," 7 pages. Make requests on company letterhead to Federal Telephone & Radio Co, Components Div, 100 Kingsland Road, Clifton, N. J.

(*More Catalogs on page* 184)

seamless FELTED ASBESTOS walls add up to long range economical service



Pictured is the application of fluffy asbestos prior to the impregnating and compressing process.

Impregnated asbestos compressed and felted to a smooth homogeneous wall ensuring long cable life.

look beneath the braid

. . . *that's where quality begins*

Long lasting, trouble-free circuit performance depends on the materials and construction of wire and cables. And a look under the braid shows why Rockbestos A.V.C. (N.E.C. Type AVA) is built to give longer service.

The two seamless, dense felted asbestos walls, compressed and thoroughly impregnated with selected compounds, seal the varnished cambric from heat and moisture.

Dielectric strength stays high under high ambient temperatures. Heat dissipation is uniform. The felted wall construction protects the varnished cambric from rupture in the sharpest bends.

HERE'S HOW YOU BENEFIT*

Get high dielectric values from Varnished Cambric because of its controlled application over seamless felted asbestos walls.

HIGH DIELECTRIC STRENGTH — minimum breakdown voltages for 600 and 1000 volt power cables — 15 KV.

MOISTURE RESISTANCE — same minimum dielectric breakdown — wet or dry — 15 KV on 600 and 1000 volt power cables.

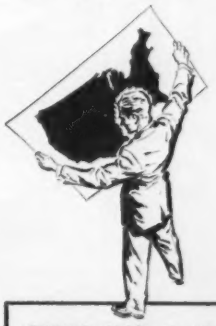
RUGGED CONSTRUCTION — minimum breakdowns after bending tests — 15 KV for 600 and 1000 volt power cables all sizes.

CONTROLLED QUALITY — materials and workmanship and performance under rigid Quality Control.

CUTS MAINTENANCE COSTS — It won't bake brittle, crack or flow in high ambients . . . won't deteriorate with age, or rot when exposed to oil, grease or fumes.

The result: wire failures are eliminated; maintenance costs are held down; plant and equipment operation maintained at top level.

*Write for the test and construction specifications of Rockbestos A.V.C. (N.E.C. Type AVA) available in the new booklet, "Specification RSS-88."



STOCKED COAST TO COAST
Standard Rockbestos A.V.C. construction (N.E.C. types AVA, AVB, etc.) are available for immediate shipment. Call or write nearest branch office.

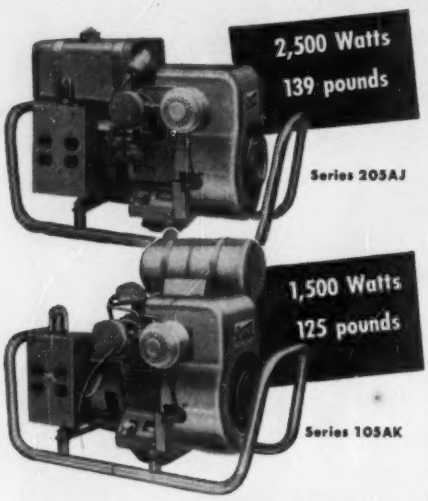
ROCKBESTOS PRODUCTS CORP.
NEW HAVEN 4, CONNECTICUT

NEW YORK CLEVELAND • DETROIT • CHICAGO • PITTSBURGH • ST. LOUIS • LOS ANGELES • NEW ORLEANS
OAKLAND, CALIFORNIA

YOU GET *4-cycle* DEPENDABILITY

AND *Light weight* TOO . . . IN AN

ONAN Electric Plant



These power-packed electric plants give you all the *4-cycle* advantages of quick starting, long life and trouble-free operation . . . with an amazing weight saving over usual 4-cycle plants. You can carry them easily to any spot . . . and you can count on them delivering their full rated capacity as long as you need it. Both are single-cylinder, air-cooled . . . completely equipped and ready to go.

Other models to 50,000 watts.

Write for special folder on lightweight models!

D. W. ONAN & SONS INC.

Onan ELECTRIC PLANTS

2948 University Ave. S. E., Minneapolis 14, Minnesota

SAFEGUARD MEN AND MOTORS

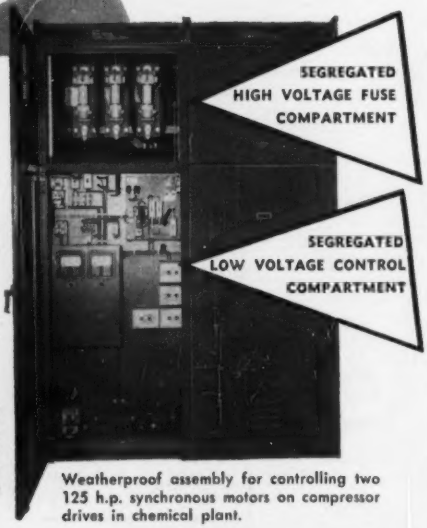
with NELSON HIGH VOLTAGE, FUSED MOTOR STARTERS

√ Safety interlock prevents access to fuse compartment until motor is taken off line.

√ The current-limiting power fuses prevent costly repairs associated with short circuits.

√ Steel barriers completely segregate high and low voltage compartments.

Nelson High Voltage Motor Starters with current limiting fuses are used for controlling 2300 to 5000 volt motors. Furnished with air-break or oil-immersed contactors. Indoor or weather-proof construction.



Weatherproof assembly for controlling two 125 h.p. synchronous motors on compressor drives in chemical plant.

• Write for details . . . . . .

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

Catalogs—Bulletins

(*Continued from page* 182)

• **BEARINGS:** Including data and applications of Oilite materials, 52-page "E-56 Engineering Manual" contains line of sleeve, flange and thrust bearings. Chrysler Corp, Amplex Div, Detroit 31, Mich.

• **DISTRIBUTION CUTOUTS:** Bulletin 1510A, 12 pages, contains descriptions, application, dimensions and performance data on manufacturer's Series C distribution cutouts. Included are open type, load-break and disconnecting, with ratings of 100 amp continuous, up to 10,000 amp interrupting and maximum design voltages of 5,200, 7,800 and 15,000. I-T-E Circuit Breaker Co, R&IE Equipment Div, Greensburg, Pa.

• **CONVEYORS:** Illustrations and descriptions of telescopic conveyors details time saving techniques in Catalog 102, 24 pages. Wilkie Co, 5520 Arch St, Phila. 39, Pa.

• **INSULATION:** Catalog 19, 20 pages, describes electrical slot insulations, wedges and fabricated parts. Insulation Manufacturers Corp, 565 W. Washington Blvd, Chicago 6, Ill.

• **SOLVENT:** Including charts on toxicity, flash point throughout evaporation cycle, and evaporation rate, 4-page folder A-28 describes detergent-action non-conductive solvent. Turco Products, Inc, 6135 S. Central Ave, Los Angeles 1, Calif.

• **CABLE:** Bulletin on Armo-Lok line, 16 pages, gives applications, features and specifications of cable. Phelps Dodge Copper Products Corp, 300 Park Ave, New York 22, N. Y.

• **HEATERS:** Catalog 27-620, 32 pages, contains data and design charts on strip, oven, immersion and cartridge heaters; natural and forced convection air heaters; melting pots; industrial hot plates; and heater control equipment. Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

• **VARIABLE TRANSFORMERS:** Specifications and applications are included in 22-page Catalog A56 on variable transformers in auto, isolated and metered models for bench and panel mounting. Standard Electrical Products Co, 2240 E. Third St, Dayton, Ohio.

• **FLOWMETER:** Construction, operation and function of Electro-Caloric flowmeter are included with specifications in 4-page catalog. Industrial Development Laboratories, Inc, 17 Pollock, Jersey City, N. J.

• **RECLOSERS:** Additions to series of hydraulically timed reclosers are detailed in Bulletins GEA-6535 on 14.4-kv, 100-amp frame size; GEA-6536 on 23-kv, 100-amp size, both 2 pages. General Electric Co, Schenectady 5, N. Y.

• **MOTORS:** Features of large end-shield bearing synchronous motors for direct-connected or geared applications to drives are described in Bulletin 05B8305, 4 pages. Allis-Chalmers Mfg Co, 932 S. 70th St, Milwaukee, Wis.

• **AIR CONTROL VALVES:** Cam, flow control, foot, hand, interlocking, pilot, pressure regulator and quick exhaust air control valves are among types described in 72-page catalog on 2, 3 and 4-way high or low pressure devices. Airmatic Valve, Inc, 7317 Associate Ave, Cleveland 9, Ohio.

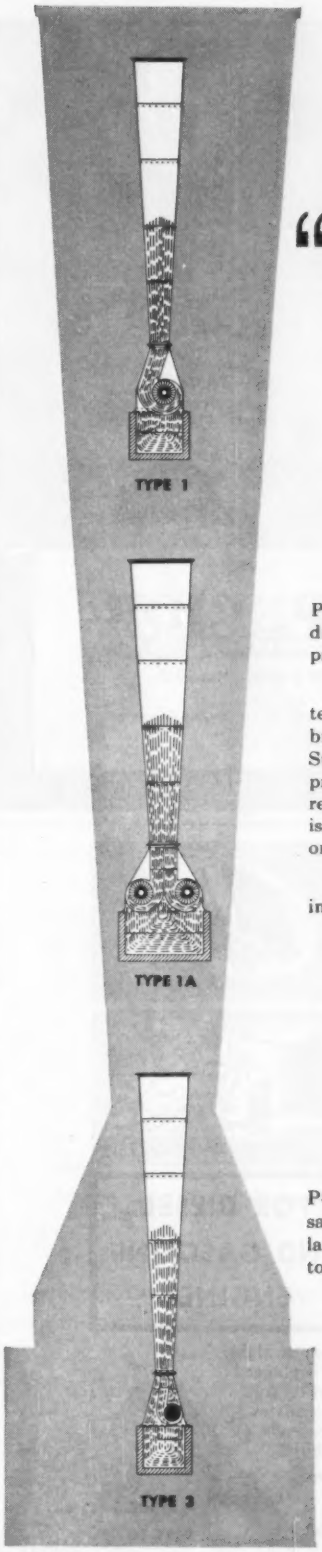
TECHNICAL LITERATURE

ASA PUBLICATIONS—Recent publications announced by American Standards Association, 70 E. 45th St., New York 17, N. Y., include:

- "List of American Standards," 56 pages (free), indexes 1,600 standards including 400 in the electrical field covering aspects of wiring, power switchgear, transformers, regulators and reactors and lightning arresters.
- "How American Standards Are Made," 20 pages (free), tells the three ways standards become nationally accepted and approved as such, who makes them and why, and who uses them. Write Dept PR.

ASTM STANDARDS—Following publications have recently been offered by American Society for Testing Materials, 1916 Race St, Phila. 3, Pa.:

- "ASTM Proceedings," 1,264 pages, records technical accomplishments of the society for 1955. It includes many reports of the 70 technical committees, and 34 papers pertaining to research and testing of materials. Much of the material has not been previously published. Price, $12.
- "Metallic Electrical Conductors," 300 pages, covers standards on 1. copper, copper alloy and copper covered steel: wire; stranded conductors; rods, bars and shapes; pipes and tubes; 2. aluminum: wire; stranded conductors; rods and bars; 3. galvanized steel core wire; and galvanized iron and steel guy, messenger, span, overhead ground and line wire. The book includes 52 standards, 43 specifications, 7 test methods, one recommended practice and one classification of coppers. Price, $3.50.
- "Copper and Copper Alloys," 654 pages, includes 127 standards, 110 specifications, 12 test methods, two recommended practices, two classifications and one definition of terms. Since the previous edition 50 specifications have been revised and a new specification for threadless copper pipe has been added. Price $5.75.
- "Atmospheric Corrosion of Non-Ferrous Metals," 164 pages, is a symposium report on a comprehensive test program begun 27 years ago for measurement of atmospheric corrosion properties of nonferrous metals and alloys. Twenty-four wrought alloys of zinc, nickel, copper, lead, tin and aluminum were utilized in nine U. S. localities and evaluated after one through 20 years, embracing 9,000 test specimens. Price, $2.75.
- "Evaluation of Insulating Oils—European Developments," 78 pages, covers European tests of transformer oils. It includes three papers and general discussion. Price $1.75.
- "Metallic Materials for Service at Temperatures Above 1,600 F," 200 pages, attempts to provide a basis of evaluation of metallic materials, including cermets, which have been undergoing study here and abroad, to determine suitability for higher temperature service. Price $3.00.
- "Pyrometric Practices," 78 pages, is a report on panel discussion by ASTM-ASME Joint Committee on Effect of Temperature on the Properties of Metals. It includes three papers and an introduction by J. W. Freeman, University of Michigan. Price, $1.50.
- "Electrical Insulating Materials (D-9)," 656 pages, lists the latest standards and includes 83 specifications and test methods issued by the society covering various types of materials in this field. It has 12 revisions and two new methods of testing silicone insulating varnishes since the 1955 edition. Price $6.



THE

"compleat"

STACK

INTEGRATED FAN, BREECHING AND STACK SELF SUPPORTING

P-D's single responsibility for draft production greatly simplifies your engineering problems.

P-D Fan Stacks are a completely integrated apparatus, consisting of I-D fan, breeching, and stack in a single unit. Straight through breeching assures high, predeterminable efficiency. Structural steel requirements are reduced and installation is simplified. Stack may be mounted directly on boiler steel where desirable.

Three basic types provide a wide latitude in application:

TYPE 1—Single I-D fan handles total gas.

TYPE 1A—Twin I-D fan for widely varying loads . . . as a standby fan . . . or for handling two boilers with a single stack.

TYPE 3—A small fan ejector in throat of stack handles portion of gas only. Patented tuyere controls ejector nozzle for load variation.

P-D Fan Stacks will give you substantial savings in original investment and installation costs. Write our Project Engineers today. Ask for Bulletin 1-PCD-1.

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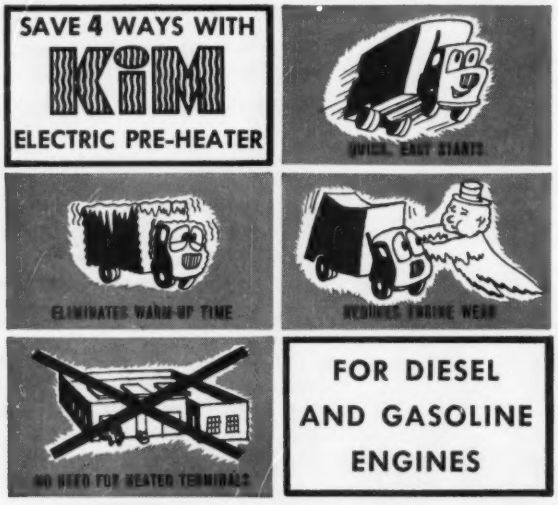
POWER DIVISION: Tubular Dust Collectors, Forced Draft Fans, Air Preheaters, Induced Draft Fans, Fan Stacks



KIM Hotstart keeps engines warm at night. It is a lightweight pre-heater that is plugged into the electric circuit. KIM draws off cold water from the engine, heats and circulates it through the engine. KIM's use ends cold starts, and cuts winter repair bills. Thousands in use.

SEE YOUR AUTOMOTIVE SUPPLIER OR WRITE FOR LITERATURE

4 MODELS EASY TO INSTALL

KIM HOTSTART MANUFACTURING COMPANY

West 917 Broadway, Spokane 1, Washington

BOOKS

Received Since July 18, 1956

Transistors in Radio and Television. By Milton S. Kiver. Published by McGraw-Hill Book Co, 330 W. 42nd St, New York 36, N. Y. 324 pages, illustrated. Price $6.50.

Factory Electrification. By F. T. Bartho and C. H. Pike. Published by Philosophical Library, 15 East 40th St, New York 16, N. Y. 398 pages, illustrated. Price $12.00.

Automation and Remote Control—Vol. XVII, No. 1. Published by Consultants Bureau, Inc., 227 West 17th St., New York 11, New York

The Generation of Electricity by Windpower. By E. W. Golding. Published by Philosophical Library, 15 E. 40th St, New York 16, N. Y. 318 pages, illustrated. Price $12.00

German Made Easier

Elektro-Technisches Englisch—5th Edition. By Henry G. Freeman. Published by W. Girardet, (22a) Essen, Germany. 491 pages. Price DM 34.80.

Technical encyclopedia and German-English dictionary are combined in this flexible-plastic-covered volume. It is divided into three approximately equal sections: The encyclopedia is basically in German but parenthetical insertion of English equivalents to technical German words make easier reading for anyone with basic knowledge of German. The remaining two sections are devoted to simple listing of German equivalents to technical English words and vice versa.

Completely new editing, enlargement, and up-dating are claimed for this 5th edition. Its vocabulary is extensive in electrical engineering, nuclear physics, and communication. The engineer with limited knowledge of the language would find this dictionary most helpful in his efforts to follow technical developments in German-speaking countries.

Putting Color in TV

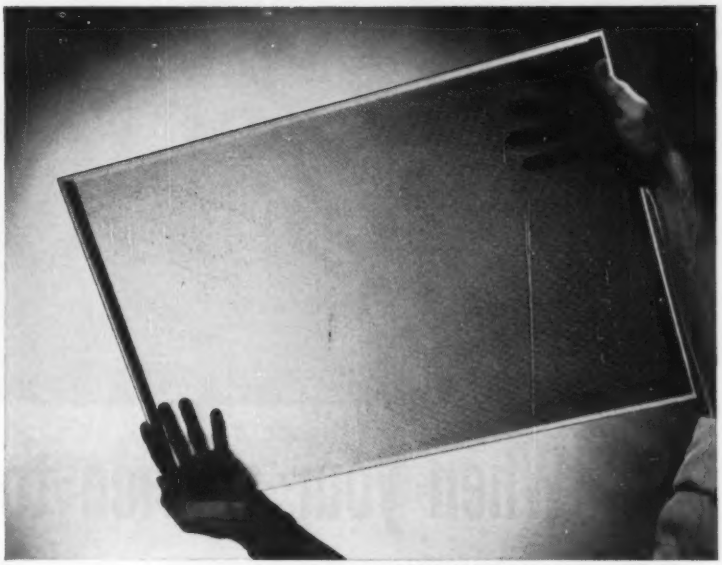
Color Television Fundamentals. By Milton S. Kiver. Published by McGraw-Hill Book Co, Inc, 330 W. 42nd St, New York 36, N. Y. 318 pages, illustrated. Price $6.00.

Providing full working knowledge of color television for technicians in the television and radio field is the primary purpose of this book. It follows a simple step-by-step development from basic fundamentals to color receivers. A complete servicing procedure is included.

Mathematics is used sparingly and in simple form. The book would be suitable as a text for technical high school or for home study.

Principal application of the book in the utility field would be for engineers whose duties include investigation of TVI complaints. But others inclined to service their own equipment could use it to guide their excursions in color.

This is the radiant heating panel backed by the PYREX trademark



And it's the only glass panel with a one-year warranty

You can rely on the proven dependability of this low-temperature-source panel to help you build your electric home heat load.

Every PYREX panel is warranted by Corning Glass Works for one full year. If, during the first year of service, a panel fails due to a defect in the glass panel, Corning will replace the panel at no cost to the manufacturer.

You can recommend the PYREX brand glass radiant panel *confidently*.

High wattage output

Because PYREX radiant panels are tempered borosilicate glass, they pack more watts per unit. One PYREX unit, for example, gives you up to 3,000 watts output in permanent installation heaters. And tempering further increases resistance to thermal shock and mechanical impacts.

With this panel, you lower the initial cost of an electrical heating system and you reduce installation costs, as well.

Full radiation

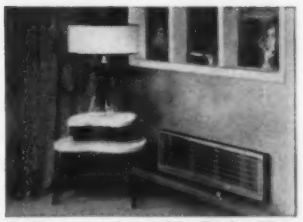
The entire back surface of the PYREX panel is coated with an electrically conductive metallic deposit. Thus, the entire panel area radiates long-wavelength infrared rays.

With the PYREX panel you get lower operating costs than with other, less efficient elements. There is no heavy starting surge.

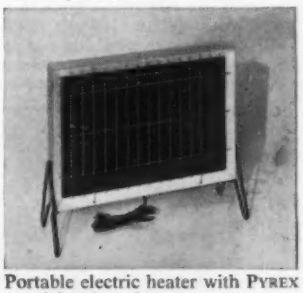
Send for full information

The PYREX panel is available to you now with years of satisfactory performance behind it. Homeowners are using it in built-in systems and in portable units.

If yours is among the utilities promoting electric heat, we would like to give you the information you need to judge this panel's place in your program. To get this data, write, wire or phone us.



Wall-mounted panel by Berko Electric Manufacturing Corp. Easy to install. The baseboard elements use PYREX panels, too.



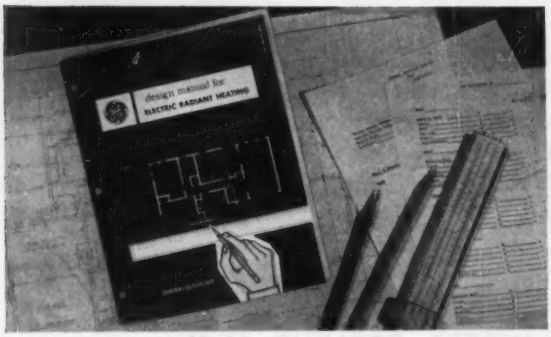
Portable electric heater with PYREX panel heating element.

CORNING GLASS WORKS, CORNING, N. Y.
39-8 CRYSTAL STREET
Corning means research in Glass

When your service to the community

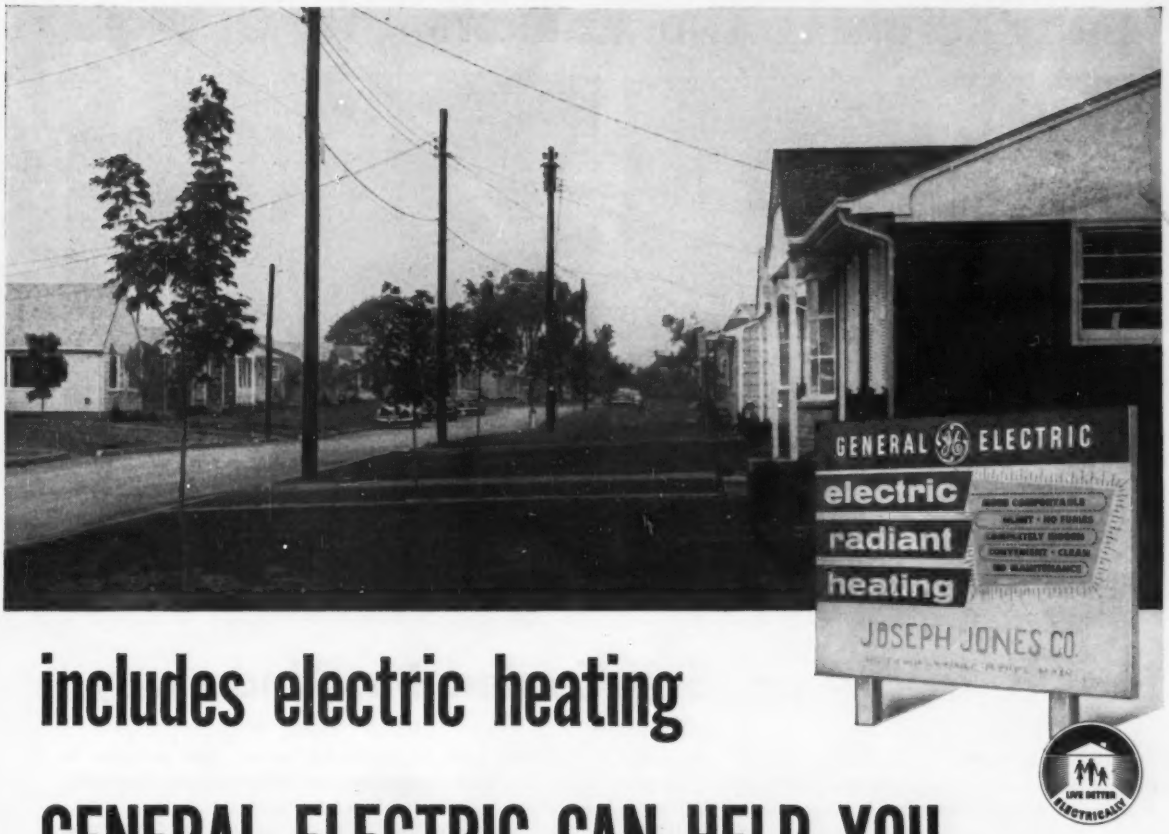
TRADE MEETINGS – General Electric representatives will assist you in planning and promoting electric radiant heating . . . will be pleased to make presentations at local meetings of architects, builders, contractors, etc.

SALES PORTFOLIO – Yours for the asking, contains a collection of folders, ad mat sheets, and other promotion material to help you develop your own electric radiant heating campaigns, and get your share of this rapidly expanding market.



DESIGN MANUAL – As an aid to proper design of electric radiant heating installations, G.E. has prepared step-by-step instructions for calculating heat loss and wiring requirements.

INSTALLATION MANUAL – Complete wiring instructions for contractors, with illustrations, for plaster-embedded and dry-wall applications. Also directions for concrete floor installations.



includes electric heating

GENERAL ELECTRIC CAN HELP YOU

With electric radiant heating, many utilities are finding a means of providing still another vital service to their communities . . . and at the same time they are developing winter residential loads to improve annual load factors.

With more and more homes featuring this modern heating system, utilities are enjoying a new source of revenue. Also, experience has shown that customers using electric radiant heating become better customers for the utility for *all other* electrical service as well.

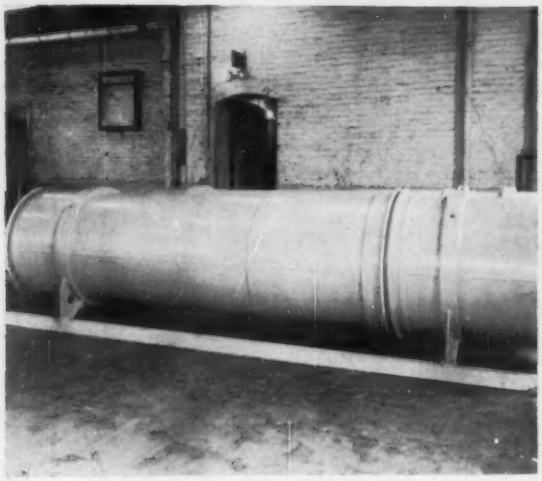
In every way, G-E electric radiant heating offers you a practical, profitable, and immediate means to help your customers *live better electrically.*

The General Electric Company has prepared a portfolio of educational and sales helps for utilities interested in offering electric radiant heating. Included are: Design and Installation Manuals, factual information for professionals and consumers, and samples of promotional aids.

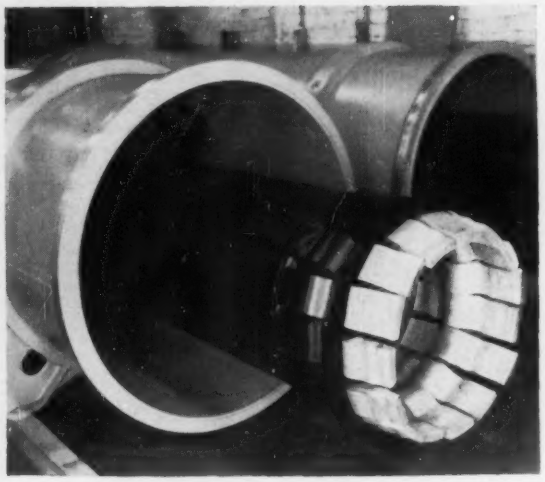
For a copy of this Sales Portfolio, or for other information on General Electric radiant panel heating, write to Wiring Device Department, General Electric Company, Providence 7, Rhode Island.

Progress Is Our Most Important Product

GENERAL ELECTRIC



I-T-E's All Aluminum . . .



All-Welded Connectors Go Into . . .

First 10,000-Amp, Self-Cooled Bus Underway

Workmen at Public Service Electric & Gas Co's Linden (N. J.) Generating Station are busy installing the largest self-cooled, isolated-phase bus built to date. It will serve as the main generator leads. About half of the 10,000-amp equipment has been shipped from I-T-E Circuit Breaker Co's Philadelphia plant. The housing and conductor are aluminum and are of all-welded construction.

The bus is rated 23 kv with a 60 kv one-minute and a 120 kv impluse withstand insulation level. About 1,000 single-phase feet will serve Linden's No. 1 and 2 units. Each of the station's generators are rated 265 mva at 18 kv. The plant will be in operation early in 1957.

Nitrogen pressurizing eliminates condensation, an I-T-E spokesman said in describing construction progress to date. Nitrogen tanks connected with necessary regulating equipment will maintain proper pressure.

To compensate for enclosure expansion, I-T-E uses rolled bellows between sections. Sheath currents in the housing are broken up by a unique application of molded epoxy to insulate adjacent sections of the aluminum housing, according to the spokesman.

The use of gaskets has been eliminated by field-welding conductor joints and covers, I-T-E said. The company assembles and shop-welds the units, and ships them as a unit. Another feature claimed by the company is that the procelain is always in compression.

Aluminum Up to 27.1¢ After Strike Settlement

Soon after the olive branch replaced battle flags over aluminum industry plants, Aluminum Corp of America announced a 1.2¢ a lb ingot increase. The hike raises the primary metal's cost to 27.1¢, 2 30-year high. Cost of pig rose 1¢ to 25¢ a lb. Prices of alloy and mill products were expected to be up about 4%.

Alcoa's price change followed settlement with the United Steelworkers of America. By early last week, the increase was being passed on by other leading aluminum companies.

Reynolds Metals Co, whose negotiations with USW had been deferred by the union pending agreement with Alcoa, followed suit with similar price adjustments. A Reynolds-USW settlement was expected soon on a three-year pact similar to the 45.6¢ an hour package reached by Alcoa.

Kaiser Aluminum & Chemical Sales, Inc., also set increases.

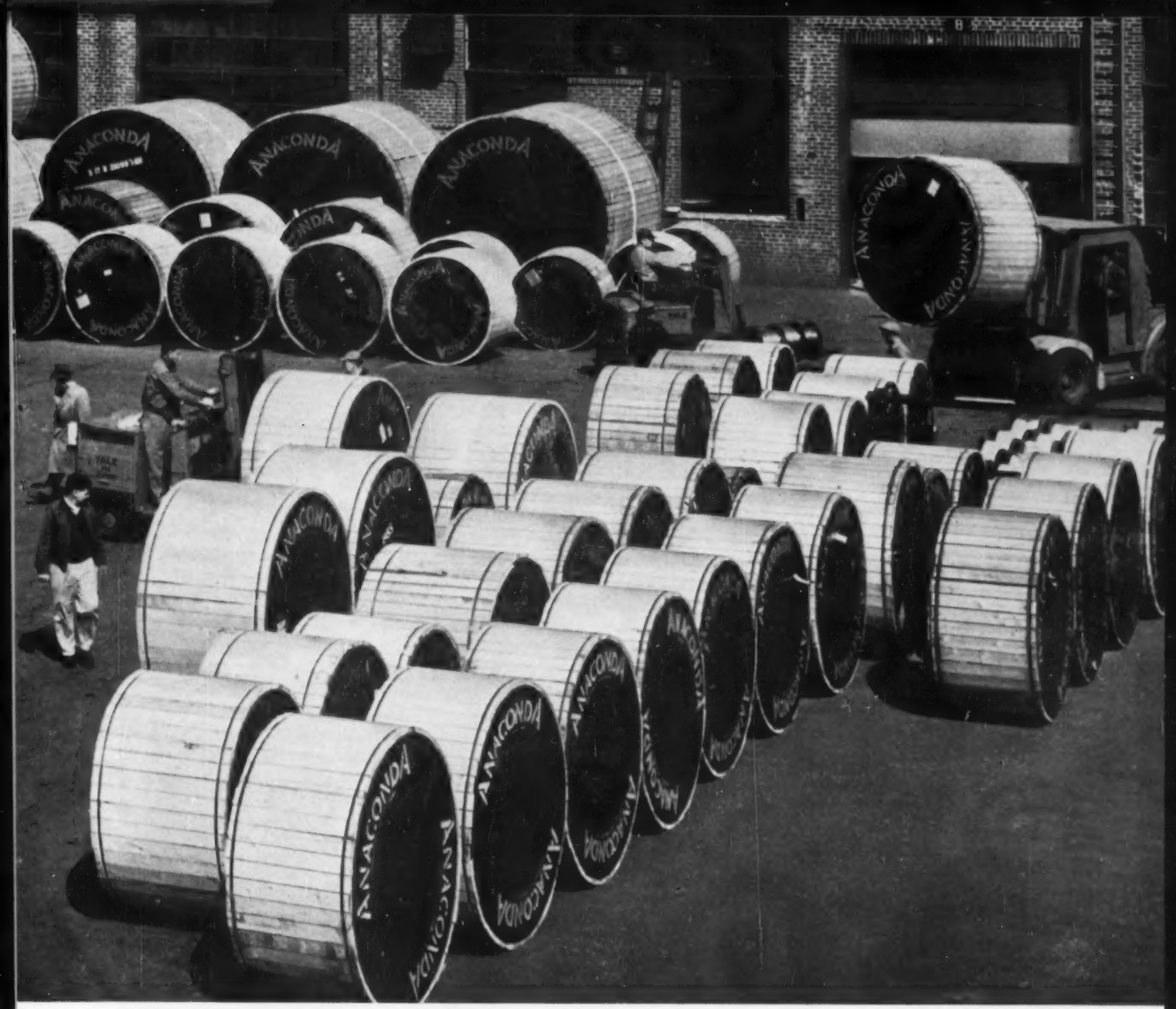
Electrical Insulation Line Offered by Westinghouse

A line of flexible insulations and treated materials is available from Westinghouse Electric Corp's Micarta Division, according to George H. McBride, division manager.

"Until now," McBride said, "electrical insulating tapes and fabrics have been available only for Westinghouse equipment and inter-works orders. The increased demand for these materials has prompted their release for industry-wide use."

Varieties of papers and fabrics treated or impregnated with oils, varnishes, or compounds are included, he added. Applications include end winding, padding, banding cushions, phase insulation, and combinations for slot insulation in Class A. Newer materials for Class B and H temperature ranges are also available, McBride said.

(More M & M on page 192)



Immediate delivery from Anaconda

Aluminum Wire and Cable—in stock and ready to go

Complete stocks of popular sizes of ACSR, service drop cables and line wire maintained at our mills for quick delivery where—and *when*—you want it: For aluminum — look to Anaconda!

1. Broadest line of aluminum conductors in the industry including bare aluminum and ACSR; Neoline*, Polene* and Duraline* line wire; Types SE, SD, N-SD and K service cables; aerial power cable; network cable; and many others.

2. Multi-mill service. Anaconda has more mills producing aluminum wire and cable than any other manufacturer. Fabricating mills strategically located across the country assure speedy service.

3. Electrical Distributors. Anaconda Wire & Cable Company has several hundred electrical distributors located throughout the country who can expeditiously provide you with Anaconda products.

4. Reduction plant at Columbia Falls, Montana, gives Anaconda control over its aluminum production from reduction of alumina . . . to wirebar . . . to rod . . . to finished product.

5. Insulated-cable experience — in design, research, construction and quality control — helps Anaconda produce aluminum wire and cable with superior electrical and physical characteristics.

6. Technical assistance. Anaconda field engineers have worked in advisory capacity on hundreds of complex jobs. They are ready to put their experience and knowledge to work on your problem.

The Man from Anaconda will be happy to help you. Backed by the broadest line of wire and cable in the industry in both copper and aluminum, he is best qualified to help you arrive at the most practical and economical answer to your cable needs. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

*Reg. U. S. Pat. Off. 56306

ASK THE MAN FROM ANACONDA®
FOR ALUMINUM WIRE AND CABLE

Ask these questions, too, when you judge a fluorescent lamp...

Is your investment protected?

Check Westinghouse Fluorescent Lamps against any other brands you are now using. Check them for maintained brightness, long life, uniform appearance. If you are not entirely satisfied on all counts, your full purchase price will be refunded.

Is it the correct type, size and color for the lighting job to be done?

In the Westinghouse fluorescent family of 290 different lamps—including Slimline and Rapid Start—there's a type and size precisely right for every office, plant and store application. Colors include seven different shades of "white" alone.

How about quality control?

From raw materials to finished product, every Westinghouse fluorescent lamp is subjected to *480 inspections and tests* before approval for shipment.

For the full story on how to get more for your money in fluorescent light, contact your Westinghouse Lamp Representative.

WATCH WESTINGHOUSE

WHERE BIG THINGS ARE HAPPENING FOR YOU!

Nuclear Notes

Blaw-Knox Pursues New Disposal Theory

A new approach to the costly, complicated disposal of nuclear reactors' waste elements is being undertaken by Blaw-Knox Co. Based on theories produced by Broohaven National Laboratory, the process involves engineering a plant that will concentrate waste in solid form, so liquids will not leach out radioactivity and contaminate surroundings. Once prepared in these sintered powders, the company says, research may be continued into feasibility of securing material in suitable containers for storage on land or sea. The process is expected to cut the $7-million or so yearly disposal cost that a city the size of Philadelphia would face if its 1,000 to 2,000-Mw consumption was supplied by nuclear energy.

New AEC Amendment

An amendment to the access permit regulation on controlled thermonuclear processes has been announced by Atomic Energy Commission. Its requirements for applicants: **1.** Must be engaged in substantial effort to develop, design, build or operate a fission power reactor planned for construction, or **2.** must possess qualifications demonstrating he is capable of making a significant contribution to research and development in controlled thermonuclear field. The amendment clears the way for dissemination of secret restricted data to holders of 36 permits granted since February.

Vitro Signs With 4 Corners

Vitro Corp of America and Four Corners Uranium Corp have reached a long term agreement which includes shipment of uranium ores from Four Corners' Green River, Utah, mines to Vitro's huge Salt Lake City custom mill. The contract calls for shipments up to 12,000 tons, which at current AEC prices would hit $20 million at the maximum.

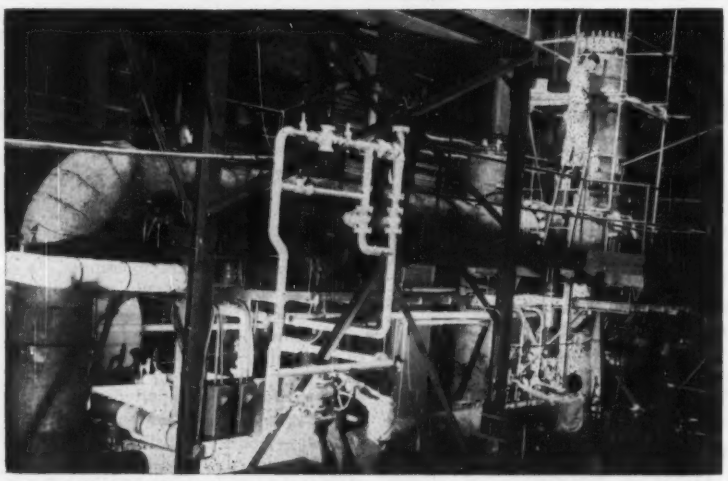
Nuclear Fuel Division Slated

Olin Mathieson Chemical Corp has announced formation of a nuclear fuel division to produce fuel elements and nuclear reactor cores. Equipment is currently being installed at the Winchester arms plant, New Haven, Conn. Pilot production will start this month. A larger plant at a site not yet chosen will go into operation in the next 18 months.

To Study Radiation

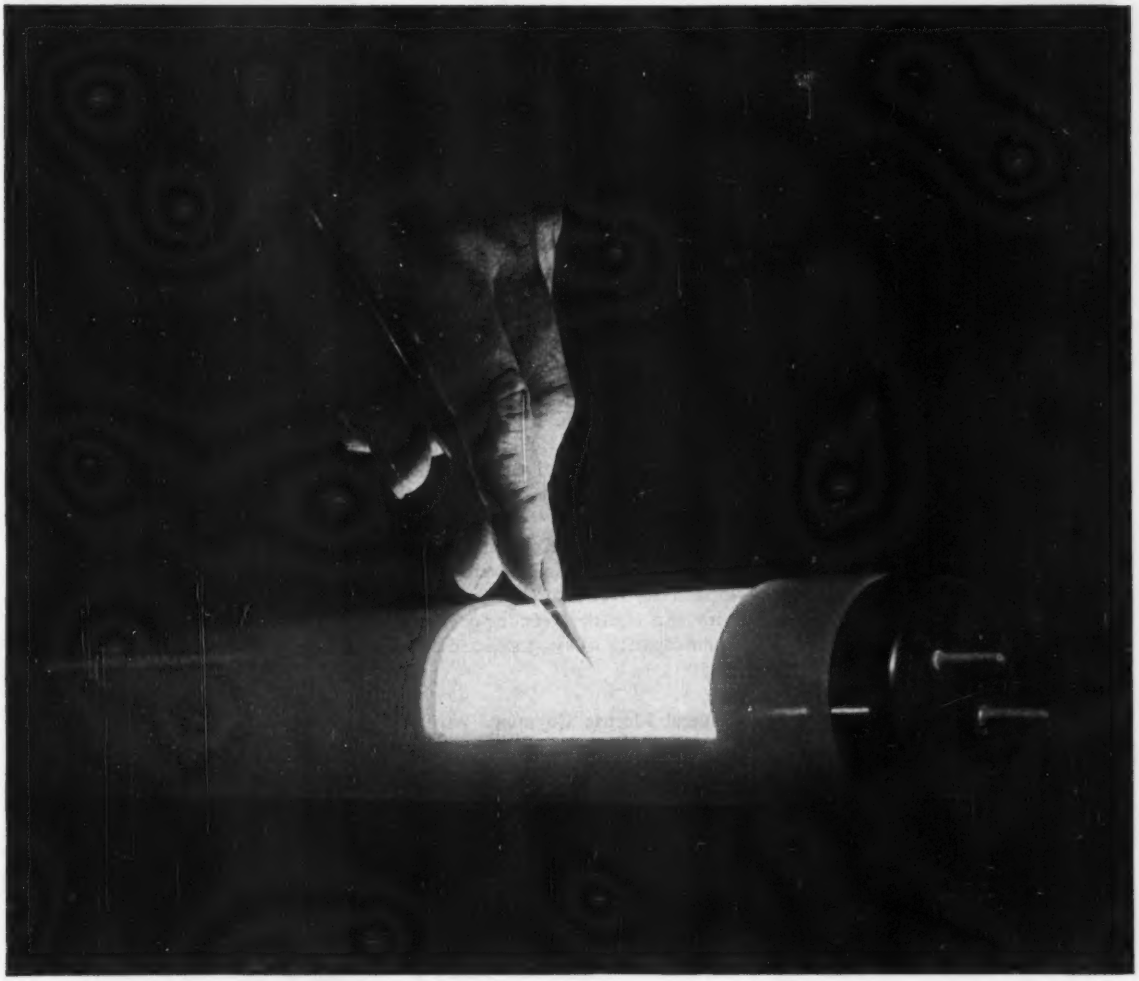
Mellon Institute has established a department of radiation research at its Pittsburgh, Pa., headquarters.

(More M & M on page 194)



BIG "CANNED" MOTOR-PUMP undergoes tests at General Electric Co's medium induction motor department. GE plans $2-million expansion at its Schenectady, N. Y. facility, which produces and tests canned motors, electromagnetic pumps

how to judge a fluorescent lamp . . . point no. 6



ask about LUMEN MAINTENANCE

Building fluorescent lamps with high *initial* lumens—high light output when the lamps are new—is difficult enough. But the real trick is to build them with high "lumen maintenance"—high light output over their entire long life. Lumen maintenance depends largely upon the stability of the lamp "phosphor"—the light-producing coating inside the glass tube. Stable phosphors give high lumen maintenance; unstable phosphors do not. Tops for stability among the different types of phosphors now in use are *Halo* Phosphors. Westinghouse (and only Westinghouse) uses Halo Phosphors throughout its whole fluorescent lamp line.

WATCH WESTINGHOUSE

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

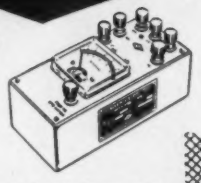
Investigate

these

METER TESTING ACCESSORIES

Now in use by Leading Utility Companies

FIELD TEST SET



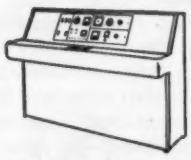
This instrument is a simple, inexpensive, portable means whereby the customer's current transformer installation may be quickly checked for basic sources of trouble.

POTENTIAL SWITCH for METER TESTING

This is a special form of the well-known snap action Micro Switch; needs only 6 ounces of pressure to operate it; long lived — modified to suit the requirements of manual control of rotating standard potential.

INSULATION TESTER

Developed in response to the need for an insulation testing device that would have: maximum safety, instantaneous indication, direct reading in megohms without calculations, ability to discriminate between a complete insulation breakdown and leakage through insulation, portability and compactness.



METER TESTING POWER SUPPLY

The purpose of this apparatus is to furnish a stable and controlled source of single phase potential and single phase current for general testing purposes, together with means for adjusting the phase angle so that power may be supplied at any desired power factor, leading or lagging.

Write for Complete Information

EASTERN SPECIALTY CO.

PHILADELPHIA 40, PA.

M&M BRIEFS

Minnesota Mining & Mfg. Co, St. Paul, Minn., recently cut prices for Scotchcast insulating resin No. 4 from 4 to 32%. The resin encapsulates electrical splices.

Elliott Co, Jeannette, Pa., has formed a Canadian subsidiary, Elliott Turbine & Electric Co of Canada, Ltd.

Apex Electrical Mfg Co and **White Sewing Machine Corp,** both among the oldest U. S. home appliance makers, are planning a merger, subject to stockholder approval.

Burndy Engineering Co, Norwalk, Conn., now offers Penetrox in 8-oz polyethylene, refillable squeeze bottles.

Challenge Mfg Co, Los Angeles, recent purchaser of Heller Mfg Corp, has upped production of Heller's trencher to fill deliveries quicker.

Kaiser Aluminum & Chemical Corp has started a $5½-million program to expand its Newark, Ohio, rod, bar, wire and electrical conductor works. Plant capacity will be increased about 23,500 tons a year.

General Electric Co upped pay 1% for employees coming under escalator provisions late last month as the Government's Index reached 116.2.

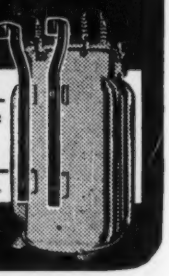
American Standards Association has published a directory listing the 115 national technical societies, trade associations, and 2,300 affiliated companies, which is available on request. Write 70 E. 45th St, New York 17.

Bailey Meter Co, 1050 Ivanhoe Road, Cleveland, 10, Ohio, has announced line of multi-purpose instruments and controls adaptable to "building block" power plant systems.

Square D Co, Detroit, Mich., recently received director approval for a three-for-one split of the company's common stock.

Bakelite Co, 30 E. 42nd St, New York, N. Y., announces its general purpose polyvinyl chloride insulating compound VFD-9033 has an additional UL listing covering 75 C thermoplastic insulated blanket wire.

THIEL TRANSFORMER HANGERS



MODEL	C-1	C-3
TRANSFORMER	75-100 KVA Single-Phase	75-112½ KVA Three-Phase
WEIGHT	46 lbs.	100 lbs.

● Thiel Hangers are made according to NEMA specifications—heavy gauge steel construction, hot-dip galvanized for dependable service and long life. Two styles complete with galvanized bolts and nuts. In stock for immediate delivery.

T-TYPE HANGERS in two sizes. For 3-50 KVA 1-Phase and 9-45 KVA 3-Phase transformers.

HANGER KICKERS in sizes to fit T-type hangers.

THIEL TOOL AND ENGINEERING CO. INC.

1417 No. Market St. • St. Louis 6, Mo.

If . . .

YOU CHANGE YOUR ADDRESS

Be sure to notify us so that future copies of ELECTRICAL WORLD will be delivered promptly.

Also make certain you advise your local Postmaster so other important mail doesn't go astray. Both the Post Office and we will thank you for your thoughtfulness.

Send your new and old address to:

Subscription Dept.

ELECTRICAL WORLD

330 W. 42nd St.

New York 36, N. Y.

"They made me a V.P. for specifying

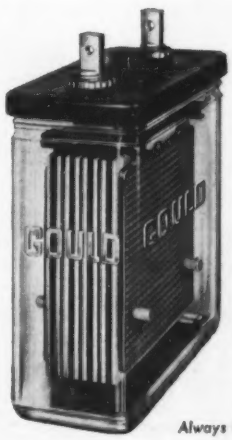
GOULD

Research-built

BATTERY POWER"

A healthy reward awaits *anyone* who chooses Gould battery power. Not only is battery power the most economical power you can buy, but Gould power gives you extra performance and extended service life possible only through years of basic and applied battery research.

Another reason for specifying Gould is Gould's Field Engineering Service. Covering all industrial centers in the nation, it's the finest in the industry . . . helps keep your batteries working at top capacity . . . adds months to their normal life. Get more power per dollar with Gould research-built battery power!



America's Finest!
GOULD PLANTÉ
The Aristocrat of Stationary Batteries

Always Use Gould-National Automobile and Truck Batteries

GOULD
BATTERIES
GOULD-NATIONAL BATTERIES, INC.
Trenton 7, N. J.

"BETTER BATTERIES THROUGH RESEARCH"

©1956 Gould-National Batteries, Inc.

ENGINEERING MEMO FROM KAISER K/W WIRE

3.1

[ORIGINAL DATA FROM K/W ENGINEERS]

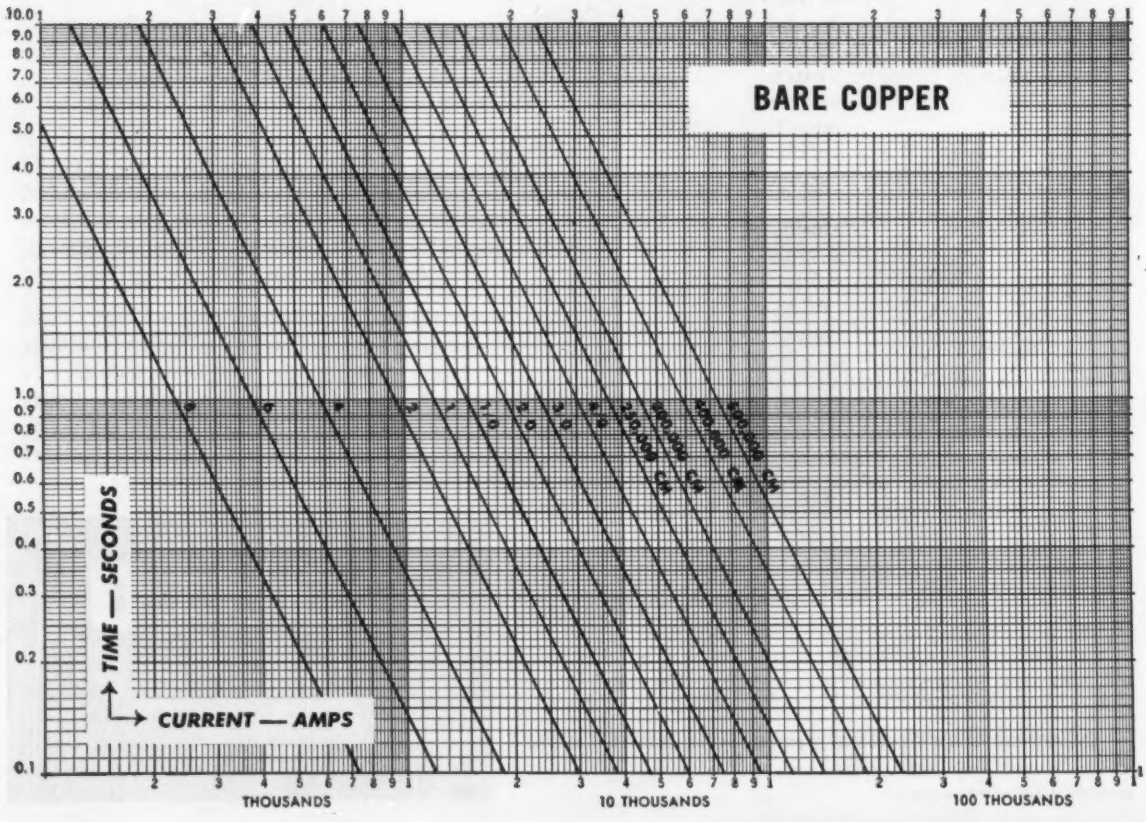
FUSING CURRENT CURVES

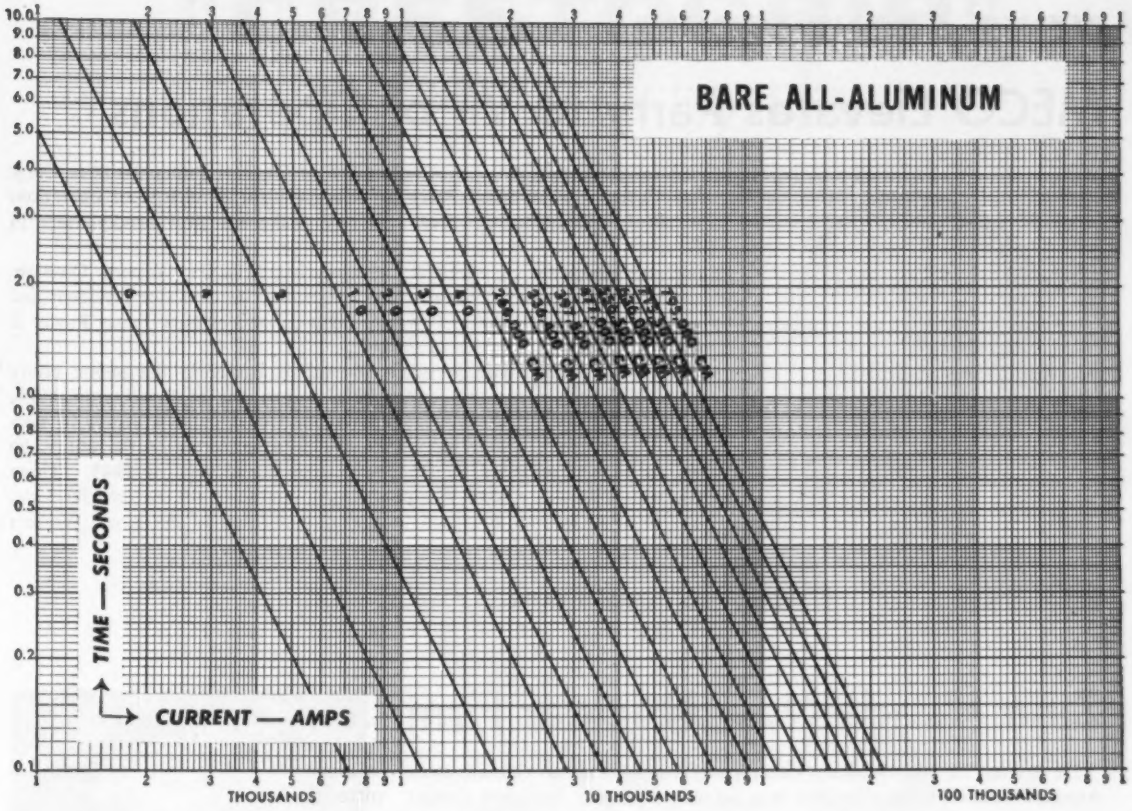
BY NEIL BARR
CHIEF ENGINEER,
ELECTRICAL CONDUCTOR DIVISION

One of the questions frequently asked relative to the use of aluminum is its burn-off characteristic. Many people believe that its short time current carrying capacity is much less than copper since the melting point of copper is higher. The curves for aluminum and copper show this is not true. The curves shown give fusing current vs. time for standard sizes of aluminum and copper conductors.

Aluminum conductor will withstand the same overload as its equivalent in copper. For equivalent D-C conductance the product of specific heat and weight of copper and aluminum respectively are such as to cause their respective melting points to be reached in approximately the same amount of time. This becomes evident when one compares the bare all-aluminum curves with similar fusing current curves for copper (published by E. R. Stauffacher, GE Review 31, No. 6, p. 326, June 1928.)

The curves shown here are for bare all-aluminum and copper conductor. The fusing time for ACSR is somewhat longer. Thus it may be expected that ACSR will carry more current for a given time or the same current for a longer time. The steel will carry some current (omitted in the calculations) and par-





tially relieve the aluminum but, of greater importance, the steel body provides a heat reservoir for the heat generated in the aluminum strands. For large ACSR sizes and those with extra high strength this effect is, of course, more pronounced. We have observed in our tests that once the aluminum has melted apart, the steel carries the entire current and melts itself in fractions of a second later.

By using the aluminum fusing current curves to compute ACSR fusing time, conservative figures will result having a "built-in" safety factor. To prepare this same type of curve for ACSR would be complicated and the results would not be of sufficient value to justify the computations.

* * *

All during the electric industry's rapid expansion, Kaiser Aluminum has concentrated on utility problems—with special emphasis on covered wire.

Today, Kaiser Aluminum is the nation's fastest growing producer of aluminum wire and cable, making available the latest helpful information on modern products and practices.

A Kaiser Aluminum representative or a K/W distributor will be glad to give you immediate attention. Call your Kaiser Aluminum sales office. Kaiser Aluminum & Chemical Sales, Inc., *Executive Office*, Kaiser Bldg., Oakland 12, California; *General Sales Office*, Palmolive Bldg., Chicago 11, Illinois.

REPRINTS OF THIS ARTICLE AVAILABLE ON REQUEST

Aluminum is the answer to Adequate Wiring

Kaiser Aluminum

THE NATION'S LARGEST PRODUCER OF ALUMINUM WEATHERPROOF WIRE AND TRIPLEX

MECO Elevates Parry to VP of Operations

Metropolitan Edison Co, a subsidiary of General Public Utilities Corp, has elected G. Raymond Parry as vice president in charge of operations in its 14-county service area. He will make his new headquarters in Reading, Pa.

Parry, former vice president in charge of MECO's Western Division, succeeds William H. McElwain, who resigned to become vice president and a director of Jersey Central Power & Light Co and of New Jersey Power & Light Co, both subsidiaries of GPUC.

The new MECO vice president started his career in the public utility industry in the company's engineering department at Reading in 1926, immediately after graduation from Lafayette College with a degree in electrical engineering. After serving in various departments of the utility, he was appointed manager of the power sales department in 1943. Three years later he was elected vice president in charge of the Eastern Division, and in 1951 he was advanced to a similar position in the larger Western Division.

G. RAYMOND PARRY

Zinn Heads New Nuclear Firm

Dr Walter H. Zinn, former director of Atomic Energy Commission's Argonne National Laboratory, has been named president of the newly formed General Nuclear Engineering Corp.

The company, located at Dunedin, Fla., has been organized to provide engineering and other services, and to carry out research and development work in connection with the design, construction, and operation of nuclear reactors and other atomic energy installations.

Zinn, a foremost authority on nuclear reactor design and a pioneer in atomic reactor development, last year was elected first president of American Nuclear Society. He was also appointed last October as a member of the 1955-56 Committee on Commercial Uses of Atomic Energy, Chamber of Commerce of the United States.

DR WALTER H. ZINN

A&FP Appoints Matson VP

David H. Matson, president and general manager of Cia. Impulsora de Empresas Electricas, S. A., has been elected a vice president of American & Foreign Power Co, Inc.

Matson, who has been associated with American & Foreign Power for 27 years, will continue his present duties with the group of companies in Mexico, where he has been since 1948.

He began his career in 1924 as manager of the Florida section of Phoenix Utility Co, then a construction organization for Electric Bond & Share. Four years later he was named chief engineer of Florida Power & Light Co, and in 1929 transferred to Argentina to become vice president and general manager of American & Foreign Power's properties there. He remained in Argentina until his promotion to his most recent post.

DAVID H. MATSON

"CRESTOGRIP"

The NEW Utility Plier

BY CRESCENT

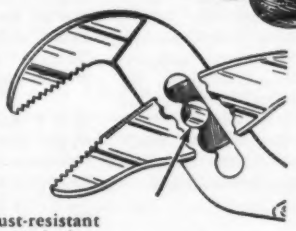
30% THINNER
TWICE AS STRONG
GRIPS LIKE A PIPE WRENCH

CLEAN, SHARP TEETH
FLUSH RIVET NO PROJECTIONS
BOX JOINT ADJUSTABLE TO 4 POSITIONS UP TO 1½" CAPACITY
EXTRA THIN—ONLY ½" AT THICKEST POINT
NON-SLIP CHECKERDOT KNURLING
P-210

Crescent's No. P210 Utility Plier is completely new ... revolutionary! It's not a "slip-joint" plier and not to be confused with conventional lap-joint "pump" pliers. Its *double-strong* box joint design is absolutely unique and assures a powerful grip like that of a pipe wrench without sideways twist or strain. It will grip flat, square, hex or round objects with powerful leverage.

QUICK, POSITIVE ADJUSTMENT

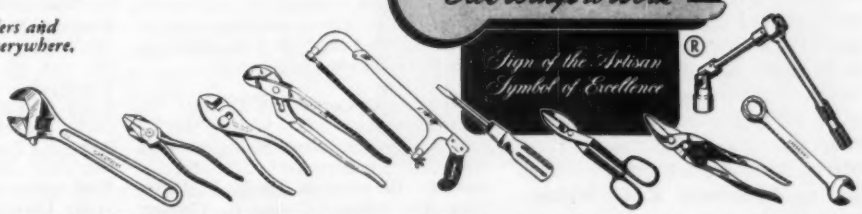
This cut-away view shows joint construction with its extra generous bearing surface at the arrow point. Adjustment is made by simply "walking" the rivet recess over the bearing point with a pumping action of the handles. Easy, positive, capable of heavy loads.



Handsomely finished in rust-resistant zinc plate. Overall length 9½ inches.

Sold by hardware dealers and industrial distributors everywhere.

CRESCENT TOOLS
Give Wings to Work
Sign of the Artisan Symbol of Excellence ®



Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

PERSONAL BRIEFS

Florida Power Corp has named **T. F. Thompson** St. Petersburg Division engineer, succeeding **R. E. Raymond,** who has been promoted to assistant superintendent of transmission and distribution. **William V. Braken,** has been upped to the post of Clearwater underground engineer.

Portland General Electric Co announces the retirement of **George E. Sullivan,** vice president in charge of operations, after 54 years of service. He started in 1909 as assistant hydraulic engineer, and after several promotions was named vice president in 1940.

Duties of **John N. Kerr, Jr,** director of information, Public Service Co of Colorado, have been increased to include his supervision of publicity. **Kenneth J. Haines,** who previously handled publicity, has resigned to become sales manager of American & Foreign Power Co.

Empire District Electric Co announces the promotion of **Leo P. Binns** as assistant to the district manager in the Baxter Springs district.

Roger K. Owen, former power sales engineer for Southwestern Public Service Co, has become its new assistant industrial manager. **William P. Bradley** has been transferred from system engineering to the operating department of Southwestern PS.

Officers for Power Engineers' Association in 1956-1957 are: **A. L. Bisbee,** chairman; **R. D. Morrison,** vice chairman; **A. R. Cumming,** secretary and treasurer . . . National Association of Power Engineers announces the election of **J. Dudley Holmes** as National Vice President. He is vice president of the Marine, Power Plant, and Export Division of Magnus Chemical Co.

Westinghouse Electric Corp's Transportation and Generator Division has appointed six engineering department managers—**J. W. Batchelor,** turbine-generator engineering department; **M. R. Lory,** ac motor and generator engineering department; **E. H. Myers,** dc motor and generator engineering department; **E. C. Whitney,** waterwheel and synchronous condenser engineering department; **G. L. Moses,** services engineering department; and **R. A. Boudry,** development engineering department. Each department head will report directly to **A. M. Harrison,** division engineering manager . . . Westinghouse's Standard Control Division has filled the vacancy caused by the recent death of **Frank H. Clark** by appointing **A. J. Hendry** sales manager.

Robert Thalner is new chief engineer of the Radio and Television Division of Sylvania Electric Products, Inc . . . H. M. Harper Co has elevated **Robert D. Tuttle** to the post of marketing manager. Tuttle formerly served as branch manager in St. Louis . . . **Robert W. Hopewell** has been appointed manager of field service for Gould-National Batteries, Inc.

New manager of advertising and sales promotion for General Electric Co's metallurgical products department in Detroit is **John W. Mason,** former senior advertising specialist. He succeeds **C. E. Thomas** who transfers to Marketing Services Division.

Robertshaw-Fulton Controls Co has appointed **Harold W. Rice** director of the West Coast research and development laboratory to succeed **H. W. Geyer,** who has resigned.

Brown Co has named **James Rogers,** former vice president of J. J. Rogers & Co, as assistant to the president.

Leeds & Northrup Co has made **Wayne L. Besselman** coordinator of technical employment. Besselman formerly headed the section in charge of development and production engineering on heat treating furnaces.

OBITUARY

Cyrus Barnes, 70, former general sales manager of the utility group presently controlled by the New England Electric System, died in Nantucket, Mass. He was connected with NEES for several years after the transfer of control and later served in the Massachusetts Legislature.

SALES ASSIGNMENTS

COMPANY STAFFS

Babcock & Wilcox Co's Tubular Products Division has announced the retirement of Frank T. Murphy as St. Louis District sales manager. J. N. Rogers is new sales representative in charge of the district office.

Four Wheel Drive Auto Co's new district sales managers are Robert M. Ashley, for territory of Montana, Utah, Colorado, New Mexico, and Wyoming, headquarters in Denver, Colo.; Glen Pate, for north Texas, Oklahoma, Kansas, and western Missouri, headquarters in Dallas, Tex.; and Robert J. Peterson, for Washington, Oregon, Idaho, Alaska, and British Columbia, with headquarters in Seattle, Wash.

General Electric Co has named William Torbick district manager for radio communication equipment covering central, eastern and nothern New York State and portions of eastern Pennsylvania.

Johns-Manville Corp's Pipe Division has designated James G. Walker northeastern regional sales manager, with headquarters in New York City, effective Sept. 1. He succeeds Charles T. Dearborn, who retires. Charles G. Topping succeeds Walker as New York area sales manager.

Rockbestos Products Corp has appointed F. J. Balzer sales representative for the Northwest territory, with headquarters in the reopened Seattle district sales office.

Sylvania Electric Products, Inc, has named Robert C. Harper director of Pacific Coast sales, with temporary headquarters in San Francisco until completion of the distribution center in Millsdale, Calif, this fall. Harper succeeds Garlan Morse, new general sales manager of the Lighting Division, Salem, Mass.

Thor Power Tool Co's Richard E. James, Jr, has been named manager of the new Indianapolis branch, and John P. Bank has been named company sales engineer.

Westinghouse Electric Corp has announced the following changes: William L. Moats, distribution apparatus sales manager, Pacific Coast region, succeeding Willis L. Winter, now a member of the staff of Vice President Walter J. Maytham; J. J. Riggs, sales manager of major appliances; Supply Co; J. P. McCully, budget manager, Meter Division; Roger K. Parsons, assistant manager of instrument sales, Meter Division; J. W. Carr, assistant manager of relay sales, Meter Division; and Frank M. Ogden, assistant to the general sales manager, Lamp Division.

Why be half safe?

Specify AUTO-SPEED interruption . . . 3E Air Interrupter Switches

Howard Shatzer, 3E field engineer, checking an Air Interrupter Switch before shipment.

What is **Auto-speed interruption** . . . an automatically produced interruption that always occurs at the same point in the switching operation, and always takes the same time (one-half cycle). Human error is eliminated from the switching action by a trigger spring mechanism which trips the switch at a pre-set point. Contacts are separated inside a dry type interrupter unit.

Specify safety for personnel and equipment. No exposed Arc. 3E Air Interrupter Switches will not produce external arcing dangerous to men or equipment.

Specify economy Costing less than circuit breakers and with interrupting capacity not found in air break disconnects, 3E Air Interrupters are ideal for . . . interrupting magnetizing charging current of transformers . . . interrupting charging current of lines and busses . . . interrupting exciting current of feeder regulators . . . interrupting load currents to rated capacity . . . sectionalizing feeders and distribution circuits.

Specify Engineering Ability 3E's staff of engineers is experienced in adapting or combining equipment for complete switching centers or additions to existing units. Designing for unusual needs . . . corrosive or dusty atmospheres, unique space requirements, portable units, or carefully calculating tomorrow's expansion requirements . . . we are geared to handle the unusual.

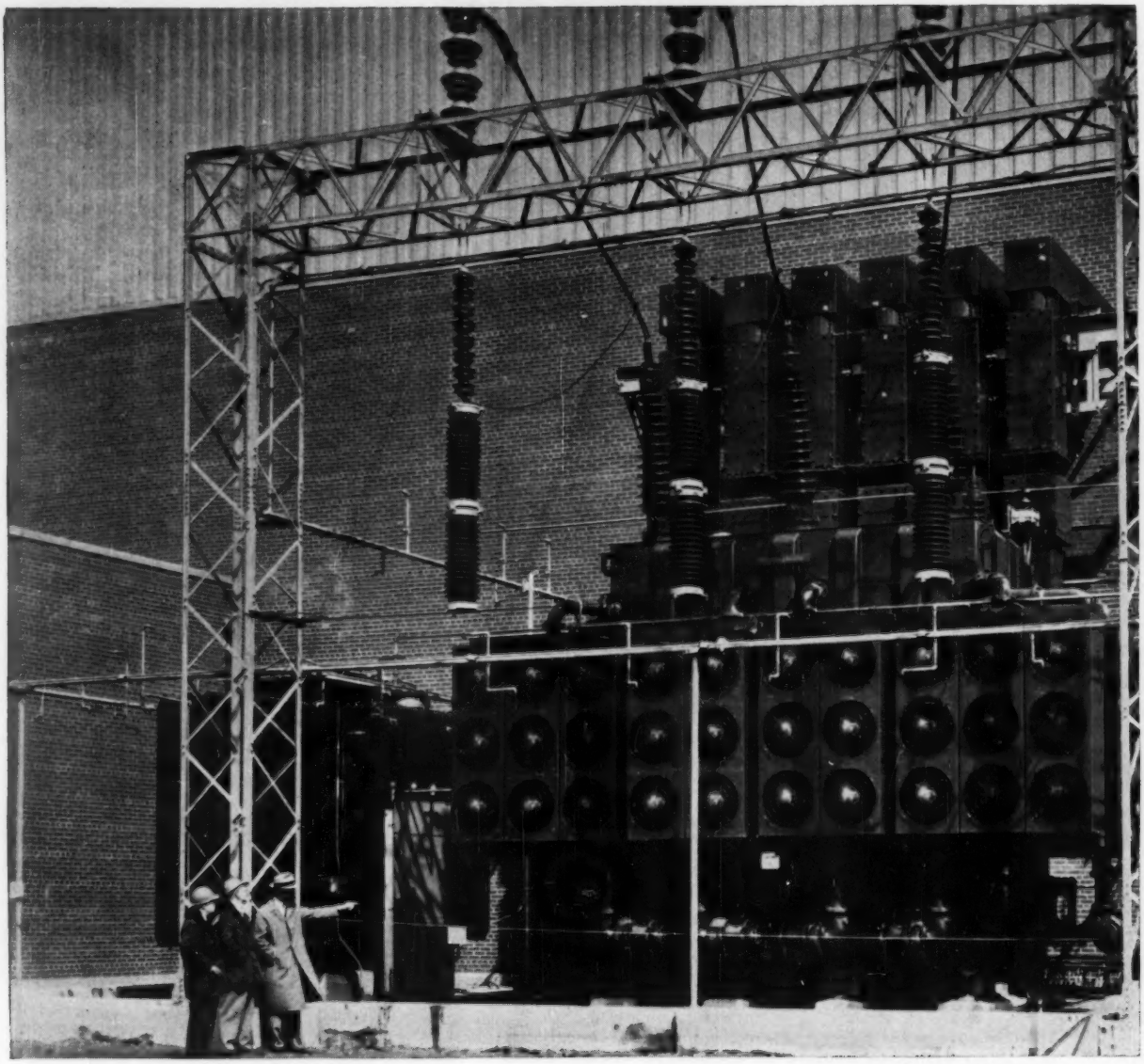
Howard Noble, 3E Sales Promotion Mgr., demonstrates Air Interrupters in a complete cubicle installation.

Write for Bulletin 152

3E Air Interrupter Switches are made in ratings up to 15 K.V.

ELECTRICAL ENGINEERS EQUIPMENT CO. Melrose Park, Illinois

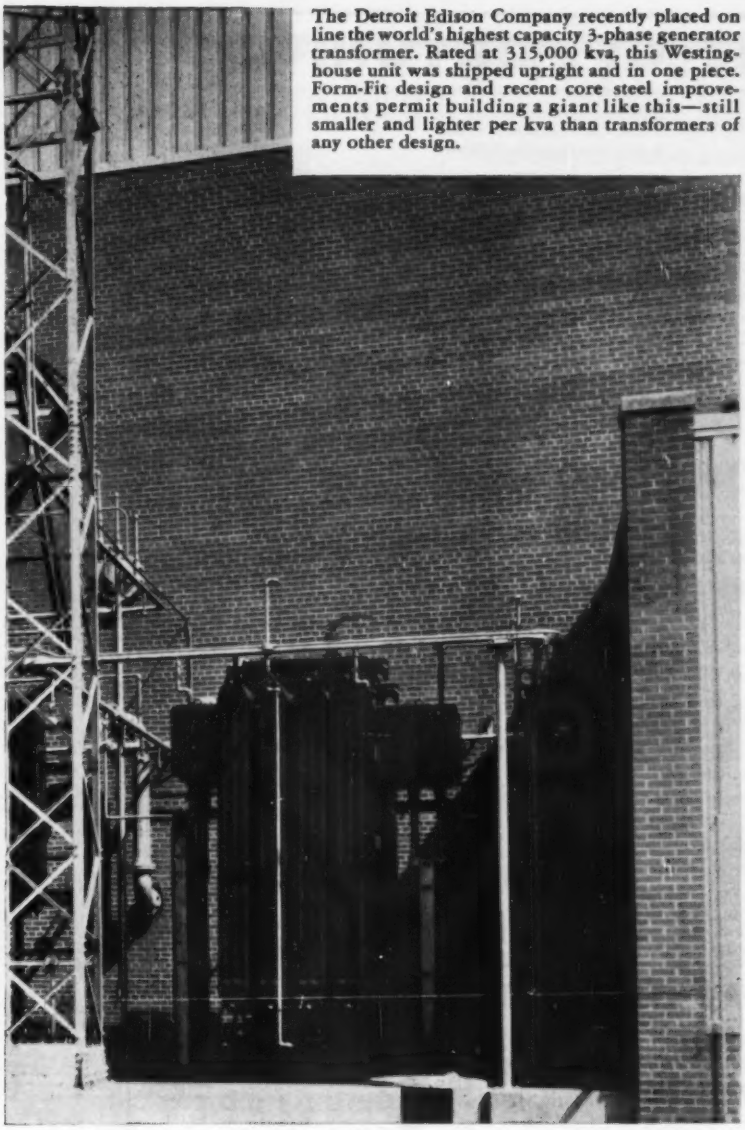
Representatives in principal cities—in Canada by Power-Lite Devices, Ltd.



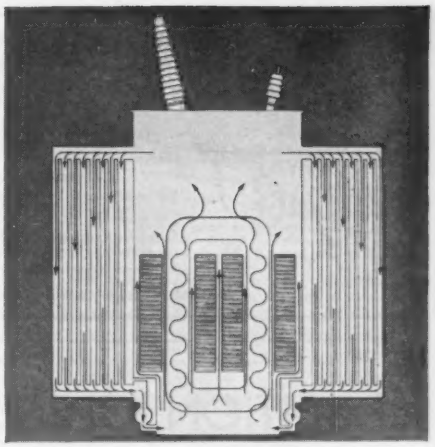
FORM-FIT® TRANSFORMERS

...A basic design with room to grow

World's highest capacity generator transformer again proves economy of exclusive Westinghouse design

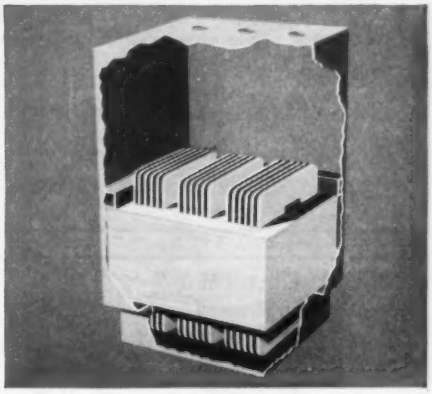


The Detroit Edison Company recently placed on line the world's highest capacity 3-phase generator transformer. Rated at 315,000 kva, this Westinghouse unit was shipped upright and in one piece. Form-Fit design and recent core steel improvements permit building a giant like this—still smaller and lighter per kva than transformers of any other design.



Close-fitting tank and vertical coil construction together form directed paths for coolant. Forced oil cooling eliminates the need for thermal head. Maximum coverage of coil surfaces and efficient use of oil give you a compact, economical unit.

With shell-form construction, the core surrounds, supports and protects a series of upright coils. This arrangement provides excellent mechanical strength . . . capable of withstanding the stresses imposed by shipping, installation and service.



Here is one basic idea in high-voltage transformers that has consistently given you more equipment per dollar invested. It's Form-Fit design. A Westinghouse exclusive, Form-Fit design has proved superlatively efficient, yet practical in both size and weight . . . at any rating.

Here is what Form-Fit construction does, for instance, to improve heat transfer while reducing bulk of the transformer. All coils are vertical, and in pancake-fashion are interleaved with insulation. This structure forms long, straight ducts allowing free flow of oil from bottom to top, and on both sides of each coil. With forced cooling, a high volume of oil circulates over a maximum surface, following these naturally efficient paths without the use of special baffles. Result? More efficient heat transfer and lower temperature differences.

And surge strength? Form-Fit design provides it, with the large-area coil giving high coil-to-coil and low coil-to-ground capacity. Distribution of impulse voltage is excellent. Dielectrically, the Westinghouse Form-Fit principle can be extended to any voltage level.

So here's a design with room to grow . . . for capacity not yet specified, for transformers not yet built. To make absolutely sure you get all the quality and performance you'd expect from Westinghouse, all power transformers rated above 10,000 kva and 69 kv are impulse tested right on the production line.

Get in touch with your Westinghouse sales engineer, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70768

WATCH WESTINGHOUSE *WHERE BIG THINGS ARE HAPPENING FOR YOU!*

EMPLOYMENT OPPORTUNITIES

The Advertisements in this section include all employment opportunities—executive, management, technical, selling, office, skilled, manual, etc.

Positions Vacant
Positions Wanted
Part Time Work

Civil Service Opportunities
Selling Opportunities Wanted
Selling Opportunities Offered

Employment Agencies
Employment Service
Labor Bureaus

DISPLAYED

The advertising rate is $19.15 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.

Subject to Agency Commission.

—RATES—

UNDISPLAYED

$1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.
Positions Wanted ads are ½ of above.
Box Numbers—counts as 1 line.
Discount of 10% if full payment is made in advance for 4 consecutive insertions.
Not subject to Agency Commission.

Send NEW ADS to Classified Advertising Div. of ELECTRICAL WORLD, P. O. Box 12, N. Y. 36, N. Y.

POSITION OPEN IN BANKING FIELD

Large New York Bank Has Position Open In Its Expanding Public Utilities Department

We are looking for a man between the ages of 30 and 35 who has a college degree and who has had experience in electric or gas utilities —preferably in finance, business research, rates and economics.

This is a permanent position through which the proper person will reach the officer category. Salary commensurate with qualifications and experience.

Those who are interested in this opportunity should write—

P-2392, Electrical World
Class. Adv. Div. P.O. Box 12, N.Y. 36, N.Y.

ENGINEERS ELECTRICAL

Senior & Asst. Engineers

DESIGN and OPERATION

Plants and Substations
Distribution and Transmission
Underground Network Systems
Relay Systems
Technical Studies
System Planning

Required by Operating Division of long established service and supervisory organization for large group of Electric Utilities located in eleven Latin American countries. Engineering assignments varied and interesting with responsibility. Some travel. Location New York. Usual employe benefits. Reply giving age, education, experience, personal particulars and salary expected.

AMERICAN & FOREIGN POWER CO. INC and SUBSIDIARIES

2 Rector Street, New York 6, New York
Personnel Dept.—DI 4-4400—14th Floor

Electrical Engineers Designers

BECHTEL

Offers you immediate long range engineering opportunity in

San Francisco or Los Angeles California

Engineers, designers and draftsmen required with the following experience:

Electrical Sub-Station
Hydro-Electric Power Plant
Steam Electric Generating Station

Liberal relocation allowances for you and your family

Send Resume to Don Palmer
Industrial Relations Division

BECHTEL CORPORATION
220 Bush Street
San Francisco 4, Calif.

For personal interview phone:
Paul Keating, Murray Hill 7-7100, New York City
Joe Braddick, Fairfax 3-2401, Houston, Texas
Bill Milligan, Tucker 1549, Los Angeles, Calif.

SR. ELECTRICAL ENGINEER

Foreign Employment

For responsible staff position which involves planning and staff engineering of new electrical power generation plants utilizing steam or gas combustion turbines and related facilities for major oil installation in Saudi Arabia.

Must be a graduate electrical engineer with proven supervisory ability with minimum ten years' experience in planning, design and study of utilities systems, power generation, transmission, distribution and related work. Minimum salary $1000 monthly plus allowances and generous benefits.

Write outlining personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 180

ARABIAN AMERICAN OIL COMPANY
505 PARK AVENUE
NEW YORK 22, NEW YORK

LIGHTING ENGINEER

Large engineering and construction firm in New York needs engineer for layout, selection and application of lighting for generating plants, electric sub-stations, industrial plants and office buildings. Applicant should be interested in the solution of technical problems related to lighting engineering.

Please send complete resume to:

P-2582, Electrical World
Class. Adv. Div.
P. O. Box 12, N. Y. 36, N. Y.

ADDITIONAL EMPLOYMENT OPPORTUNITIES on opposite page

EMPLOYMENT OPPORTUNITIES

ELECTRICAL & MECHANICAL ENGINEERS

Good pay, five days per week, and excellent employee benefits. Live in Michigan, a thriving part of the country and work for an expanding and growing company. Consumers Power Company has engineering positions in electric distribution engineering, substation design, electric production, and general gas engineering. Please send resume to

R. E. Beatty
Employment Supervisor

CONSUMERS POWER COMPANY
Jackson, Michigan

REPLIES (Box No.): Address to office nearest you c/o This publication Classified Adv. Div.
NEW YORK: P. O. Box 12 (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

Hydro Superintendent for 35,000 KW Plant in Central California. Some technical training desirable. Excellent housing, complete benefit plan. Send qualifications to P-2631 Electrical World.

Electrical Superintendent to supervise heavy industrial electrical construction. Salary $200.00 per week and up depending on qualifications. P-2636 Electrical World.

Executive Engineer with E.E. or M.E. degree to take charge of mechanical and electrical departments of large national contractor. Salary $12,000.00 per year and up depending on qualifications. P-2639 Electrical World.

POSITION WANTED

Distribution Engineer, age thirty six with nine years experience desires position with Public Utility. PW-2648 Electrical World.

SEARCHLIGHT SECTION

FOR SALE
SUBJECT TO PRIOR SALE
200 Westinghouse Type CO, Inverse Time Relays, Rated 0.5/2.5 Amperes, 60 Cycle, with Universal Operation Indicator. In Modern Flexitest Cases Which Can Be Mounted Either Flush or Projection. All in First Class Condition. Can Be Used Interchangeably. Styles Nos. 1271197, 1273197, 1545824 and 1545812. If Interested Contact N. C. Stirewalt, V. P., Central Illinois Public Service Company, Springfield, Illinois.

MOTORS · GENERATORS
TRANSFORMERS
NEW · REBUILT
WORLD'S LARGEST INVENTORY
ELECTRIC EQUIPMENT CO.
PHONE STATION COLLECT · GL 6784
ROCHESTER 1, NEW YORK

U. S. Government

DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-4742) will be received at Denver, Colorado, until September 11, 1956, for furnishing one 2,500-volt, metal-enclosed, indoor-type, motor control equipment assembly; and one 600-volt, metal-enclosed, indoor-type, station-service control center assembly for Frenchman Springs Pumping Plant, Columbia Basin Project, Washington. Delivery is desired within 270 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver 2, Colorado. W. A. Dexheimer, Commissioner.

SEARCHLIGHT SECTION

(Classified Advertising)

BUSINESS OPPORTUNITIES · EQUIPMENT - USED or RESALE

RATES

UNDISPLAYED
$1.50 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.
BOX NUMBERS count as one line additional in undisplayed ads.
DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals.)

DISPLAYED
The advertising rate is $14.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request. AN ADVERTISING INCH is measured 7/8 inch vertically on one column, 3 columns—30 inches—to a page.
EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

Send NEW ADVERTISING to Classified Advertising, P. O. Box 12, N. Y. 36, N. Y.

TRANSFORMERS

SPECIAL PURCHASE

five carloads
13800 volt transformers
sizes 25 KVA to 250 KVA
new and slightly used

What can you use?
Write for list and prices

Many other items in stock

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.
5316 Hetzel St.
Cincinnati 27, Ohio

40 Years' Dependable Service

SUBSTATION EQUIPMENT

TRANSFORMERS

QU.	KVA	MFGR.	VOLTAGE
3	200	Pitts.	66,000—2300
3	1500	Wag.	44,000—6900/11950
3	1250	A.C.	44,000/11500—460
3	75	West.	44,000—7200/12470Y
3	5000	G.E.	38100/66000—6600
3	3333	G.E.	38100/66000Y—33000
4	3125	Mol.	39900/66000Y—26600/46000Y
1	3500	West.	33,000—13,800
3	3333	G.E.	33000/11000—2400/7200
2	3000	Stand.	33000—4160, 3 Ph.
3	1500	A.C.	34,500—2300
3	667	A.C.	33,000—2400/4160Y
3	500	West.	34,400—13,800
4	333	Kuhl.	33,000—7200/12470Y
3	200	A.C.	34500—2400/7200/12470Y
3	75	Wag.	33,000—240/480
1	3000	A.C.	23,380—2500/4330Y, 3 Ph.
3	1000	G.E.	23,310—2500/7500/12990Y
3	100	G.E.	22,000—7200/12470Y
3	50	G.E.	22,000—2300
2	3000	G.E.	13,800—600, 3 Ph. Unit Sub.
3	1200	West.	13,800—600, 3 Ph. Unit Sub.
1	1000	West.	13200—2300, 3 Ph. Unit Sub.
1	1000	A.C.	13800—480, 3 Ph.
3	1000	G.E.	13800—240/480
1	600	Stand.	13200—2300, 3 Ph.
1	450	Penna.	13200—2400, 3 Ph. ASKAREL
3	200	G.E.	13200—2400
1	2500	A.C.	11,000—2400/4160Y, 3 Ph.
1	1500	G.E.	11,500—4000, 3 Ph.
3	125	A.C.	6600—2300
3	333	G.E.	2400/4160Y—460
3	200	West.	2400—240/480
3	150	West.	2400—230/115
1	100	G.E.	2300—575, 3 Ph.
6	50	West.	2400—114/228, Dry Type

OIL CIRCUIT BREAKERS

6—600 A., 15 KV, G.E., FK-155, 350 MVA
2—600 A., 15 KV, G.E., FLO-15, 50 MVA
2—400 A., 37 KV, G.E., FHKO-136, 350 MVA

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MEETINGS CALENDAR

AUGUST

WESTERN ELECTRIC SHOW AND CONVENTION—Pan Pacific Auditorium and Ambassador Hotel, Los Angeles, California, Aug. 21-24.

SEPTEMBER

NORTHWEST PUBLIC POWER ASSOCIATION, INC—Meter School, Oregon State College, Corvallis, Oregon, September 10-14; Accounting Section, Cascadian Hotel, Wenatchee, Washington, September 11-14.

EDISON ELECTRIC INSTITUTE—Organization Meeting, sponsored jointly with AGA, Edgewater Beach Hotel, Chicago, Ill., Sept. 13-14; Industrial Relations Round Table Conference, Drake Hotel, Chicago, Ill., Sept. 17-19; Meter & Service Committee, Purdue University, Lafayette, Ind., Sept. 24-26.

MARYLAND UTILITIES ASSOCIATION—32nd Fall Conference, Cavalier Hotel, Virginia Beach, Va., Sept. 14-15.

PUBLIC UTILITIES ASSOCIATION OF THE VIRGINIAS—38th Annual Meeting, Greenbrier Hotel, White Sulphur Springs, W. Va., Sept. 14-15.

AMERICAN SOCIETY FOR TESTING MATERIALS—Second Pacific Area National Meeting, Statler Hotel, Los Angeles, Calif., Sept. 16-22.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—3rd Annual Electrical Conference of the Petroleum Industry, Kansas City, Mo., Sept. 17-19; Fifth Annual Industrial Electronics Symposium, sponsored jointly with the Institute of Radio Engineers, Hotel Manger, Cleveland, Ohio, Sept. 24-25.

ILLUMINATING ENGINEERING SOCIETY—National Technical Conference, Hotel Statler, Boston, Mass., Sept. 17-21.

INSTRUMENT SOCIETY OF AMERICA—11th Annual Instrument-Automation Conference and Exhibit, New York Coliseum, Sept. 17-21.

MISSOURI VALLEY ELECTRIC ASSOCIATION—Accounting Conference, Lassen Hotel, Wichita, Kansas, Sept. 20-21.

SOUTHEASTERN ELECTRIC EXCHANGE—Engineering & Operations Section, John Marshall Hotel, Richmond, Va., Sept. 20-21.

ATOMIC INDUSTIAL FORUM, INC—3rd Annual Forum Conference and 2nd Annual Trade Fair, Morrison Hotel and Navy Pier, Chicago, Ill., Sept. 24-28.

PENNSYLVANIA ELECTRIC ASSOCIATION—49th Annual Meeting, Hotel Wm. Penn, Pittsburgh, Pa., Sept. 25-26.

ELECTRIC COMPANIES PUBLIC INFORMATION PROGRAM—Steering Committee, Blackstone Hotel, Chicago, Ill., September 26; Workshop Conference, Blackstone Hotel, Chicago, Illinois, September 26-28.

OCTOBER

EDISON ELECTRIC INSTITUTE—Prime Movers Committee, Radisson Hotel, Minneapolis, Minn., Oct. 1-3; Area Development Committee Meeting, Oct. 3, and Area Development Committee Workshop, Radisson Hotel, Minneapolis, Minn., Oct. 4-5; Electrical Equipment Committee, Hotel Statler, Cleveland, Ohio, Oct. 15-16; Transmission and Distribution Committee, Hotel Statler, Buffalo, N. Y., Oct. 18-19.

ILLINOIS INSTITUTE OF TECHNOLOGY—12th Annual National Electronics Conference, sponsored jointly by AIEE, Institute of Radio Engineers, University of Illinois, and Northwestern University, Hotel Sherman, Chicago, Ill., Oct. 1-3.

NATIONAL ELECTRONICS CONFERENCE—12th Annual Conference and Exhibition, Hotel Sherman, Chicago, Ill., Oct. 1-3.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Fall General Meeting, Morrison Hotel, Chicago, Ill., Oct. 1-5.

CANADIAN ELECTRICAL MANUFACTURERS' ASSOCIATION—12th Annual Meeting, Sheraton Brock Hotel, Niagara Falls, Ontario, Canada, Oct. 3-5.

INDIANA ELECTRICAL ASSOCIATION—Annual Convention, French Lick Springs Hotel, French Lick, Ind., Oct. 3-5.

MISSOURI VALLEY ELECTRIC ASSOCIATION—Sales and Rural Conference, Hotel President, Kansas City, Mo., Oct. 3-5.

STANDARDS ENGINEERS SOCIETY—Fifth Annual Meeting, Hotel Willard, Washington, D. C., Oct. 3-5.

SOUTHEASTERN ELECTRICAL EXCHANGE—Sales Conference, Tides Hotel & Bath Club, St. Petersburg, Fla., Oct. 3-5; Accounting Meeting, Hotel Seville, Miami, Fla., Oct. 10-11.

INTERNATIONAL ASSOCIATION OF ELECTRIC LEAGUES—Sheraton-Cadillac Hotel, Detroit, Mich., Oct. 3-6.

PENNSYLVANIA ELECTRIC ASSOCIATION—Electrical Equipment Committee, Arlington Hotel, Binghamton, N. Y., Oct. 4-5; Hydraulic Power Committee, Mountain View Hotel, Greensburg, Pa., Oct. 4-5; Relay Committee Meeting, Hotel Robert Treat, Newark, New Jersey, Oct. 25-26.

ROCKY MOUNTAIN ELECTRICAL LEAGUE—Annual Fall Convention, Broadmoor Hotel, Colorado Springs, Colo., Oct. 7-10.

INTERSTATE POWER CLUB—Hotel Martinique, New York, New York, Oct. 8.

ILLINOIS INSTITUTE OF TECHNOLOGY—Conference on Computer Applications, Chicago, Ill., Oct. 9-10.

INTER-INDUSTRY FARM ELECTRIC UTILIZATION COUNCIL—National Power Use Workshop, Milwaukee Auditorium, Milwaukee, Wis., Oct. 15-16.

IOWA UTILITIES ASSOCIATION—Annual Management Conference, Hotel Fort, Des Moines, Iowa, Oct. 15-16.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Electrification of Machine Tools Conference, Sheraton-Gibson Hotel, Cincinnati, Ohio, Oct. 22-24.

UNIVERSITY OF TEXAS—Ninth Power Distribution Conference, University Batts Auditorium, Austin, Tex., Oct. 22-24.

AMERICAN STANDARDS ASSOCIATION—38th Annual Meeting and 7th National Conference on Standards, Hotel Roosevelt, New York, Oct. 22-24.

NATIONAL SAFETY COUNCIL—44th National Safety Congress & Exposition, Chicago, Illinois, Oct. 22-26.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS—South Central Region Meeting, M & M Building, Houston, Texas, October 23-26.

NORTHWEST PUBLIC POWER ASSOCIATION—Power Use Section, Franklin PUD Auditorium, Pasco, Wash., Oct. 25-26.

MONTANA STATE RURAL ELECTRIC COOPERATIVE ASSOCIATION—Annual Meeting, Lewiston, Mont., Oct. 29-31.

NOVEMBER

LOUISIANA POLYTECHNIC INSTITUTE—Fifth Annual Instrumentation Conference, Ruston, La., Nov. 1-2.

NATIONAL RURAL ELECTRIFICATION COOPERATIVE—Region Nine Annual Meeting, Davenport Hotel, Spokane, Washington, Nov. 12-13.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION—Annual Meeting, Traymore Hotel, Atlantic City, New Jersey, November 12-16.

EDISON ELECTRIC INSTITUTE—Industrial Relations Committee, EEI Headquarters, New York, N. Y., November 15; Accident Prevention Committee, Statler Hotel, Hartford, Connecticut, November 26-28.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—22nd National Exposition of Power and Mechanical Engineering, Coliseum, New York, N. Y., Nov. 25-30.

GREAT LAKES CONFERENCE OF RAILROAD AND UTILITIES COMMISSIONERS—First Annual Convention, Greenbrier Hotel, White Sulphur Springs, W. Va., Nov. 29-30.

DECEMBER

INSTITUTE OF RADIO ENGINEERS—2nd Instrumentation Conference, Biltmore Hotel, Atlanta, Ga., Dec. 5-7.

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NEWS IN BRIEF *Continued from page 101*

HYDRO

Unless rain falls soon, Central Arizona's water supply reservoirs will reach virtual exhaustion of storage by Oct. 1 . . . **Alabama Power Co** has applied for permission to build $37-million new generating facilities on Warrior River. A 300-ft dam would go on Sipsey Fork and would have two generators with total capacity of 160,000-kw; two more machines would go in existing Government Lock No. 17, to add 45,000 kw . . . **Pacific P&L** is planning a $5-million, 45,000-kw expansion of its Merwin hydroplant, to start this year . . . **Montana Power Co** has started its fifth dam on Missouri River, near Great Falls. To cost $13 million, it will produce 60,000 kw by 1957.

California-Oregon Power Co, Yreka, Calif., has applied for license for a $17-million, 65,000-kw development on McCloud River in California . . . **Aluminum Co of Canada** said it will start construction immediately on a $1-million hydroplant in North Quebec . . . **Public Service Co of Indiana** has requested construction permit for hydro station at Indiana end of the proposed Markland navigation dam on the Ohio River. Average annual output should be about 400-million kwhr. . . . A move has begun in eastern Oregon **to add six more hydro generators at McNary Dam,** where the Corps of Engineers just installed the 14th and last unit. . . . The fifth 64,000-kw unit at **Chief Joseph Dam** near Wenatchee, Wash., was scheduled to begin service Aug. 8 . . . **Pacific Northwest Power Co** has stated that it is ready to begin Mountain Sheep and Pleasant Valley dams on the Snake River.

REA CO-OPS and MUNICIPALS

Ringgold, Ga., citizens have voted to buy power from North Georgia Electric Membership Corp instead of renewing Georgia Power's franchise. . . . The Texas Supreme Court has ruled that **rural co-ops can sell electricity to anyone** in a district served by the co-op even though a city may annex the area. Southwestern G&E contended unsuccessfully that the co-op could maintain only its original customers, that it could not expand service in the area.

Recent REA loans: $17 million to Central Nebraska Public Power and Irrigation District, **Hastings, Neb.,** for 100-kw steam station . . . $9 million to Loup River Public Power District, **Columbus, Neb.,** for 300 mi of transmission lines . . . $1.8 million to Consumers Power, Inc., **Corvallis, Ore.,** for distribution line and system improvements . . . $254,000 to Spoon River Electric Co-op, **Canton, Ill.,** for same . . . $182,000 to Nyman Electric Co-op, **Stanton, Iowa,** for same . . . $118,500 to McCook Public Power District, **McCook, Neb.,** for new headquarters . . . $705,000 to Farmers Rural Co-op, **Glasgow, Ky.,** for distribution line and system improvements . . . $575,000 to Clark Rural Electric Co-op, **Winchester, Ky.,** for same . . . $610,000 to Cotton Electric Co-op., **Walters, Okla.,** for distribution line and reimbursement for funds spent previously on approved construction.

In addition: $125,000 to Ashley-Chicot Electric Co-op, **Hamburg, Ark.,** for distribution line and system improvements . . . $193,000 to Gunnison County Electric Ass'n, **Crested Butte, Colo.,** for distribution line, and purchase and rebuilding of Lake City LP's facilities . . . $100,000 to Roosevelt County Electric Co-op, **Portales, N. M.,** for loaning to 200 members to help them buy wiring, plumbing, appliances, and irrigation facilities . . . $730,000 to Lincoln County Electric Membership Corp, **Fayetteville, Tenn.,** for distribution line and system improvements . . . $925,000 to Jackson Electric Co-op, **Edna, Tex.,** for same, with some money going for more headquarters facilities.

PROPERTY TRANSFERS

Northern States Power Co has negotiated for transmission and distribution facilities of Interstate Power Co, Dubuque, Minn., serving 13 communities . . . **Lewis County PUD** has applied to take over a permit held by City of Tacoma, Wash., for construction of $37.1-million Mayfield Dam on Cowlitz River, but FPC has rejected . . . **Central Illinois Light and Illinois Power Co.** are negotiating property exchanges.

Changes in Capacity Reported to FPC

PLANT ADDITIONS DURING JUNE

State	Utility	Plant	Fuel	Capacity
Fla.	Orlando Utilities Commission	Orlando	S	33,000
Kans.	Kansas Gas & Electric Co	Murray Gill	S	100,000
Kans.	Wilson Municipal Water & Light Dept	Wilson	IC	1,000
La.	Central Louisiana Electric Co	Teche	S	50,000
La.	Lafayette Utilities System	Pinhook	S	12,650
Md.	Berlin Municipal Electric Plant	Berlin	IC	1,400
Mo.	Carrollton Municipal Utilities	Carrollton	IC	1,500
Mo.	Kahoka Municipal Electric Light & Water Dept	Kahoka	IC	900
N. Y.	New York State Electric Gas Corp	High Falls	H	6,000
Pa.	Pennsylvania Power & Light Co	Martins Creek	S	132,500
Texas	Central Power & Light Co	Lon C. Hill	S	66,000

RETIREMENTS

Me.	Casco Bay Light & Power Co	Peak Island	IC	90
Mich.	Consumers Power Co	Smyrna	H	240
Miss.	Amory Electric Dept	Amory	IC	640
Mo.	Kahoka Municipal Electric Light & Water Dept	Kahoka	IC	200
N. Y.	Niagara Mohawk Power Corp	*Schoellkopf	H	334,800
Texas	Texas Electric Service Co	Fullerton	IC	136

U. S.	Hydro	Steam	IC	Total
Added	6,000	394,150	4,800	404,950
Retired	335,040	.....	1,066	336,106
Adjustments Plus	.....	.....	.....	.....
Adjustments Minus	.....	.....	240	240
Net Change	−329,040	+394,150	+3,494	68,604

H—Hydro, IC—Internal Combustion, S—Steam

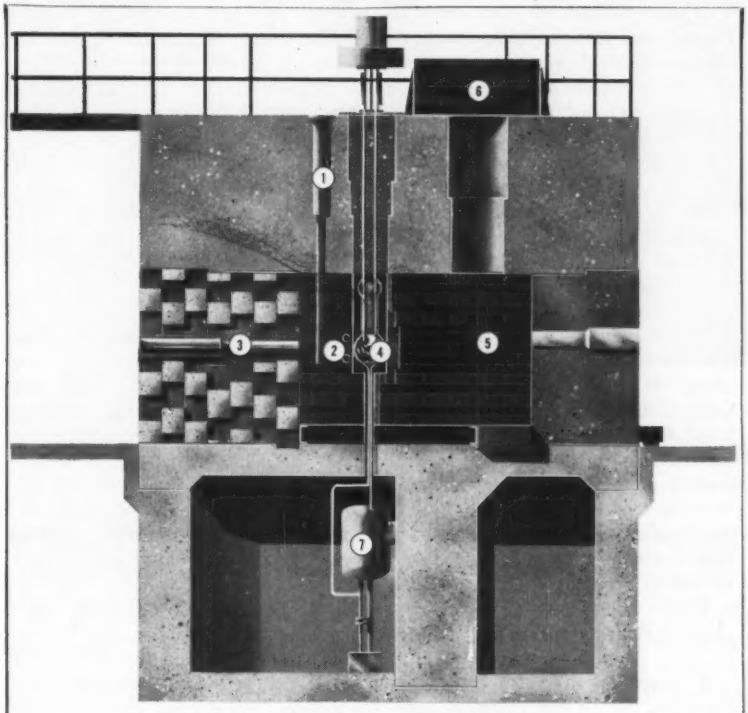
United States Capacity as of July 1—Hydro, 25,132,831 kw; Steam, 89,996,723 kw; IC, 2,372,121 kw; Total, 117,501,675.

*Plant completely disabled by rock slides. Some portion of capacity may be restored to service.

NUCLEAR NEWS FROM ATOMICS INTERNATIONAL

Aqueous, homogeneous type nuclear reactor being built for Japan

The first nuclear reactor for the Far East is being built by ATOMICS INTERNATIONAL for the Atomic Energy Research Institute of Japan. The reactor will be located near Tokyo. When the reactor starts operating early in 1957, a full program of research into the peaceful applications of nuclear energy will begin. This program includes the production of radioisotopes, studies in neutron activation, neutron diffraction, radiation effect on materials and training in reactor techniques.



Solution Type Research Reactor for Japan.

1—Vertical thimble
2—Pneumatic tubes
3—Beam Tubes
4—Central exposure facility
5—Horizontal thermal column
6—Vertical thermal column
7—Gamma radiation area

At a rated power of 50 kilowatts, this solution type reactor will produce a peak thermal neutron flux of 1.7 x 10^{12}/cm² sec. Equipped with a five foot graphite thermal column, it will provide an extensive source of slow neutrons. Additionally, the room beneath the reactor housing the gas handling system has been designed to provide neutron-free gamma irradiation. This facility, ideally suited for biological and chemical experiments, will provide 50,000 curies of radioactivity in Xenon and Krypton gases circulating in the system.

The core of the reactor is a stainless steel sphere with a diameter of approximately 12 inches, filled with a uranyl sulphate solution. The fuel investment is approximately 1000 grams of Uranium^{235}. The reflector around the core consists of graphite stacked in a rectangular steel tank 5 feet high, 5 feet wide and 8 feet long. Appropriate holes for experimental facilities and instrumentation are located in the graphite. Five feet of dense concrete provides a shield around the reflector tank.

Instrumentation control is provided by two types of sensing elements which give neutron level information. In the power range up to approximately 1 watt, two fission chambers are employed. In the power range of approximately 0.1 to 50,000 watts, two gamma compensated ionization chambers are used. One of these chambers is fed into a shutdown channel and an electrometer which in turn sends a signal to the power level recorder. Power level is automatically maintained by feeding an error signal from the level recorder to a servo-amplifier which drives the regulating rod motor in the proper direction to correct error. The other ionization chamber feeds a logarithmic amplifier, and period shutdown circuit.

The core cooling system consists of a closed, recirculating system using demineralized light water. The core cooling loop includes about 90 feet of stainless steel tubing, the associated pump, valves and piping, and a heat exchanger to transfer the heat to a secondary cooling system.

ATOMICS INTERNATIONAL, a division of North American Aviation, Inc., is a major reactor builder—experienced in the design, construction and operation of nuclear reactors for research and the production of power. A reactor similar to the one scheduled for Japan has been installed for the Armour Research Foundation of the Illinois Institute of Technology in Chicago. It is one of several in-action nuclear reactors designed and built by ATOMICS INTERNATIONAL.

If you are interested in any phase of reactor technology, ATOMICS INTERNATIONAL is staffed and equipped to serve you. Please write: Director of Technical Sales, Department EW-N4, ATOMICS INTERNATIONAL, P.O. Box 309, Canoga Park, California. Cable address: ATOMICS.

ATOMICS INTERNATIONAL
A DIVISION OF NORTH AMERICAN AVIATION, INC.
PIONEERS IN THE CREATIVE USE OF THE ATOM

PP&L Told to Cut Rates by $1.4 Million (Continued from page 98)

ject by this route the "substitute plant theory." This also was rejected by the commission.

The commission, in buttressing its action on this point, quoted the U. S. Supreme Court in the case of McCardle *vs* Indianapolis Water Co: "There is to be ascertained the value of the plant used to give the service and not the estimated cost of a different plant. Save under exceptional circumstances, the court is not required to enter upon a comparison of the merits of different systems."

2. Treatment of Account 100.5. In consonance with Superior Court decision of Aug. 30, 1954, the commission ruled that the company should eliminate from operating expenses the amount of $1,728,675 which the commission had previously allowed. But it permitted the unamortized balance of Account 100.5 to remain on the books of the company for rate-making purposes, since, as the Court put it: "There is no good reason why the amount paid for these intangible values may not remain permanently on the books of the company."

3. Rate Base. As stated above, the commission determined the fair value rate base to be 20% over net original cost. It is interesting to note that, in the measurements of value, the commission did not allow anything for cash working capital and deducted an amount of $2,968,237 in restricted surplus which had arisen from income taxes deferred on the amortization of emergency facilities.

4. Rate of Return. The fair return on the fair value of the property was set at 5.7%. In this connection evidence was put in by the company on hypothetical capitalization wherein a substantially higher amount of common stock capital was assumed than currently exists for the purposes of, as the company put it to, "obtaining long-run financial health".

The commission, in its consideration of a hypothetical capital structure, did not depart materially from that existing at the present time when it said: "Based on all of the evidence of record, we adopt a capital structure range of 45-50% debt, 20% preferred stock and 30-35% common equity capital for the purpose of weighting the respective cost rates which we find appropriate to determine a reasonable composite cost of capital."

In its finding for the current replacement cost, of capital, the commission arrived at a rate of 5.35%-5.49% and, consequently, the fair and reasonable return over and above this amount is of the order of .35% to .21%. This would appear to be about the maximum range by which the fair return exceeds the cost of capital granted by most commissions.

5. Amortization of Deficiency of Depreciation Reserve Requirement. In dis-allowing a claim by the company for the amortization of the difference between accrued depreciation of $69,916,405 in Account 100.1 applicable to the original cost of plant as of Feb. 28, 1955, based on a life and mortality dispersion study in 1954, and $59,642,891 actually accrued on the same plant and based, in turn, on a depreciation study of 1950, the commission said: "In other words, the 1954 depreciation study indicated a composite life of depreciable plant of about 40 years, whereas the 1950 study indicated a composite life of about 48 years. Would respondent be satisfied with a lesser allowance for annual depreciation if the situation were reversed? We think not, yet in the interest of consistency and fair play that would follow if a deficiency in reserve requirement between 1954 and 1950 studies is now to be charged to respondent's customers."

6. Amortization of Emergency Facilities. While the commission allowed the company's claim of $2,598,283 for deferred income taxes arising from amortization of emergency facilities, it made its opinion very clear that it held contrary opinions with respect to accelerated depreciation. It said: "Contrary to opinions expressed in accounting orders of some commissions and statements of many commentators, it is the opinion of this commission that the tax effect of the five-year amortization of the cost of specifically identified large items of emergency facilities, regardless of actual life, is not the same in principle and certainly is vastly different in practical dollar effect than normalization of the tax effect of accelerated depreciation over the 50-year life of the cost of any or all plant additions after Dec. 31, 1953, which we have rejected in two prior rate orders."

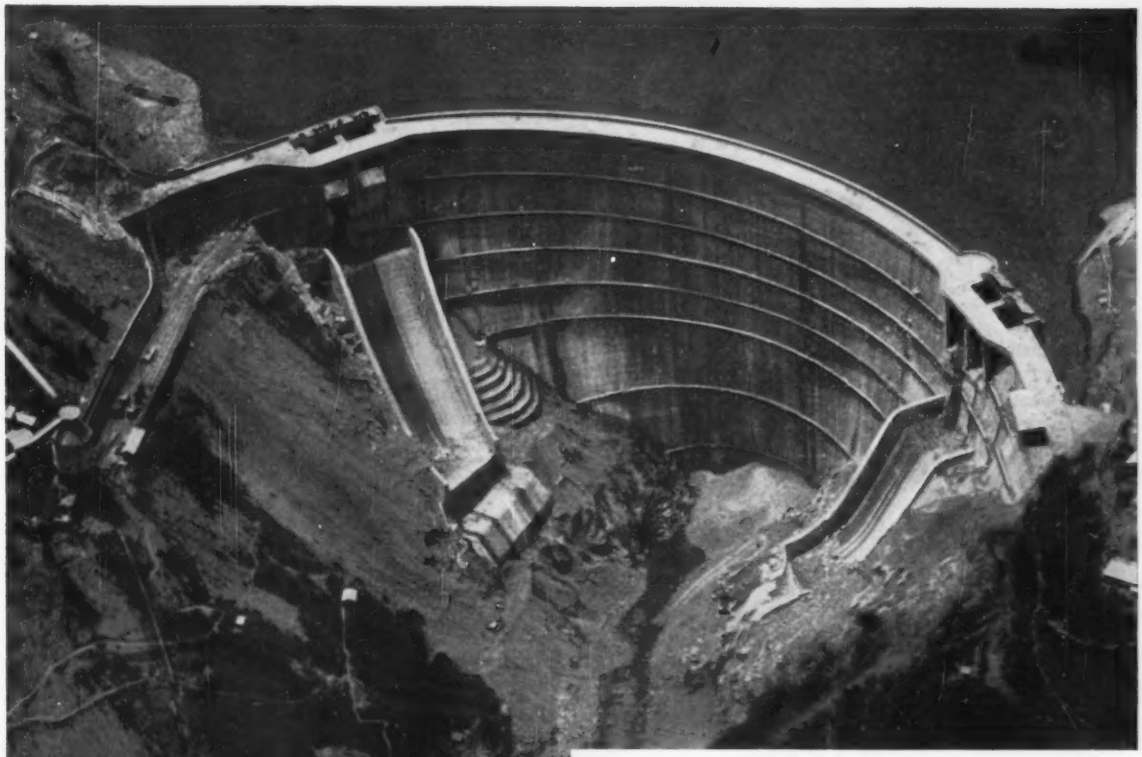
The PUC, after noting that it had rejected tax normalization principle in two prior rate proceedings because it concluded that in effect accelerated depreciation created a permanent reduction of taxes rather than a deferral. The PUC stated that the staff of this commission has received no response from utilities invited informally to submit projections demonstrating that, under growth conditions expected to prevail, accelerated tax depreciation would ever be less than normal tax depreciation."

It is important to note that the company did not ask for any rate-making or accounting treatment for accelerated depreciation and, hence, it is curious why the commission went to such great pains to explain why accelerated amortization should be normalized and accelerated depreciation should be disallowed.

7. Tax Depreciation Variance. The respondent's claim that the tax depreciation rate based on 3.25% per annum on all depreciable property should be brought in line with the book and rate-making rate of 2.43% per annum was disallowed by the commission on the grounds that "Although respondent has not elected to take accelerated tax depreciation under Section 167 of the 1954 internal Revenue Code, respondent's claim for normalization of the tax effect of the depreciation variance is based primarily on the same false argument that present customers are receiving the benefit of paying lesser income taxes than are properly applicable to today's conditions and that future customers will be burdened with this cost."

Oil-Cooled Wires Hailed

Liquid-cooled conductors, called the electrical industry's first use of combination cooling in large generators, was highlighted in Cleveland Electric Illuminating Co's dedication of a new Eastlake Power Plant addition recently. The 240,000-kw General Electric Co unit uses an oil coolant circulated through stator's hollow windings while hydrogen gas cools rotating field windings.



THE ORIENT'S FIRST ARCH DAM

Now spanning the gorge of the Mimi River in mountainous southern Japan is the Kamishiiba Arch Dam, highest dam in that country and the first of its type in the Orient.

This recently completed project rises 372 feet high, is 1200 feet across. This structure, unique in Japanese dam building, is designed to resist the heavy earthquakes prevalent in the region. The dam will impound seasonal flood waters in one of Japan's largest power storage reservoirs for use by six hydroelectric projects downstream.

Ebasco's work on Kamishiiba for the Kyushu Electric Power Company included preliminary study, supervision of design and construction, and the training of Japanese personnel.

Successful completion of the project is the highlight of Ebasco's five-year association with the Japanese power industry.

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AEC Pacts Okayed

Campbell gives qualified approval of power contracts with EEI and OVEC

Joseph Campbell, U. S. Comptroller General, has issued qualified approval of the power contracts between Atomic Energy Commission and Ohio Valley Electric Corp and Electric Energy, Inc.

Campbell finds in both cases that cost of permanent power to the government is "reasonable in comparison with the average cost of producing power throughout the country." He also finds the provision for earnings after income taxes of 8% on equity "is reasonable in comparison with the average earnings on equity of private electric utilities."

However, Campbell believes that lack of a ceiling on cost of power to AEC "is a major weakness" in the contracts from the government's point of view. The use of an open-end cost-type contract for purchase of electric power is "not fully protective to the interests of the government," says Campbell.

The reports make these other observations:

OVEC contract—

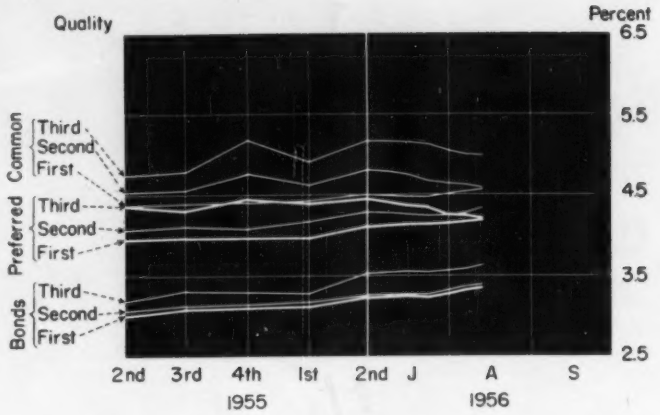
- AEC administration of activities under the OVEC contract has been adequate to protect the government's interest.
- OVEC has "performed competently" under the contract, and as a result, "substantial financial benefits have accrued to the government . . ."
- Recorded construction costs of $317.4 million as of Sept. 1955 "represent fairly the cost incurred. . ."

EEI contract—

- Cost of interim power sold the government from Sept. 1954 to Feb. 1955 "was excessive." But later this rate "was substantially reduced."
- The government could have insisted "on a larger share of the benefits" resulting if EEI generates more power than contemplated "which benefits accrue primarily to the sponsoring companies."
- Construction costs of $181.7 million as of Sept. 1955 "represent fairly" costs incurred "subject to recording of the Ebasco settlement."

AEC's estimated annual costs for permanent power will be $24.7 million from EEI and $60 million from OVEC.

Today's Utility Yields (%)



QUALITY.....	BONDS			PREFERRED STOCKS			COMMON STOCKS		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Aug. 9.....	3.37	3.41	3.64	4.20	4.33	4.57	4.21	4.59	5.00
Aug. 2.....	3.35	3.39	3.60	4.18	4.28	4.55	4.25	4.62	5.01
July 26.....	3.31	3.35	3.58	4.16	4.24	4.51	4.26	4.64	5.06

Utility Earnings

COMPANY	PERIOD MONTHS	ENDED	NET INCOME 1956	NET INCOME 1955	EARNINGS PER COMMON SHARE 1956	EARNINGS PER COMMON SHARE 1955
Arizona Public Service.....	12	June	$5,778,000	$5,175,000	$1.44(a)	$1.48(a)
Baltimore Gas & Electric.....	12	June	15,657,000	13,579,000	2.27(a)	2.15(a)
Central Illinois Electric & Gas...	12	June	3,078,973	2,573,433	2.35	1.91
Central Maine Power.....	12	June	6,447,562	6,522,706	1.67	1.69
Columbus & Southern Ohio Electric.....	12	June	6,594,000	6,024,000	2.16(f)	2.15(f)
Commonwealth Edison.....	12	June	48,743,780	45,254,568	2.72(b)	2.72(b)
Community Public Service.....	12	June	1,449,722	1,460,724	1.77	1.78
Consolidated Edison of New York	12	June	52,260,814	51,571,136	3.12	3.07
Dallas Power & Light.....	12	June	7,337,784	6,929,200	....	....
Delaware Power & Light.....	12	June	5,647,011	4,780,023	2.53(a)	2.15(a)
Duquesne Light.....	12	June	18,727,670	16,612,766	2.46	2.17
Idaho Power.....	12	June	5,587,447	4,837,345	2.11	1.80
Lake Superior District Power.....	12	June	1,173,893	1,341,546	....	....
Montana-Dakota Utilities.....	12	June	3,563,966	2,845,701	1.59	1.36
Niagara Mohawk Power.....	12	June	30,358,604	29,395,666	2.30	2.22
Northern Indiana Public Service.	12	June	12,380,552	10,956,237	2.84(c)	2.64(c)
Northwestern Public Service.....	12	June	951,887	903,400	....	....
Ohio Edison and subsidiary.....	12	June	24,418,922	21,936,559	3.73	3.30
Pennsylvania Power.....	12	June	2,962,624	2,735,148	....	....
Public Service of Indiana.....	12	June	13,319,205	12,485,056	2.46	2.43
Public Service of New Mexico.....	12	June	1,903,887	1,692,500	1.07	0.95
Rockland Light & Power.....	6	June	1,437,169	1,076,504	0.73	0.51
Seattle, Wash., Department of Lighting.....	12	May	5,416,759	5,724,804	....	....
Texas Electric Service.....	12	June	11,768,597	10,497,644	....	....
Texas Utilities, consolidated.....	12	June	25,691,164	23,882,878	2.10	2.02
Tucson Gas, Electric Light & Power.....	12	June	1,990,245	1,882,649	1.83	1.72
Utah Power & Light, consolidated	12	June	7,460,977	6,494,704	3.36	3.18
Wisconsin Public Service.....	12	June	5,285,000	4,909,000	1.77	1.62
West Penn Electric, consolidated.	12	June	17,900,098	16,578,270	2.11	1.96

Notes—(a) Based on average shares; (b) Based on 17,906,517 shares in 1956 and 16,630,622 shares in 1955; (c) Based on 3,708,937 shares in 1956 and 3,593,778 shares in 1955; (f) Based on 2,651,000 shares in 1956 and 2,401,000 shares in 1955.

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Advertising In This Issue

Allis-Chalmers Mfg. Co.
4th cover, 50, 51, 57, 58, 59, 60, 161
Aluminum Co. of America..52, 53, 178
American Brass Co..... 155
American Bridge Div.
United States Steel Corp..... 39
Anaconda Wire & Cable Co....89, 191
Anderson Electric Corp..... 35
Atomics International Div. North American Aviation, Inc..... 209
Automatic Switch Co..... 165

Babcock & Wilcox Co.....14, 15
Bakelite Co. Div. Union Carbide & Carbon Corp..... 83
Baltimore & Ohio Railroad..... 78
Biddle Co., James G..... 146
Blackburn Corp. Jasper..... 79
Brewer-Titchener Corp..... 86
Buffalo Forge Co..... 216
Burndy Engineering Co., Inc..... 18
Bussmann Mfg. Co.....36, 37

C & D Batteries, Inc..... 168
Chance Co., A. B..... 147
Chevrolet Div. General Motors... 38
Coles Cranes, Inc..... 145
Collyer Insulated Wire Co..... 160
Colorado Fuel & Iron Corp.
Div. Wickwire Spencer Steel.. 61
Corning Glass Works..... 187
Crescent Tool Co..... 199

Delta-Star Electric Division
H. K. Porter Company, Inc..... 139
Directory of Engineers..... 214
Dow Chemical Co., The..... 167
Dow Corning Corp..... 177
duPont de Nemours & Co. (Inc.)
Polychemicals Dept..... 77

Eastern Specialty Co..... 194
Ebasco Services Inc..... 211
Electric Service Mfg. Co.....42, 43
Electrical Engineers Equipment Co. 201
Elliott Co..... 87
Engineers, Directory of..... 214
Exide Industrial Div. The Electric Storage Battery Co.....3rd cover

Fanner Mfg. Co..... 152
Flint Steel Corp..... 174
Four Wheel Drive Auto Co..... 80

G & W Electric Specialty Co..... 149
General Electric Co.
Apparatus Dept.
62, 63, 84, 85, 126, 127, 129
130, 131, 132, 133, 136, 137
Electronics Dept..... 34
Insulator Dept. 73
Lamp Dept..... 213
Silicone Products Dept..... 179
Wiring Devices Dept.....188, 189

Graybar Electric Co., Inc..... 5
Grinnell Co., Inc..... 8
Gould-National Batteries Inc..... 195

Hazard Insulated Wire Works... 4
Hexcel Products Inc..... 31
Holan Corp. J. H..... 159
Hubbard & Co..... 163

I-T-E Circuit Breaker Co.
R&IE Equipment Div.....54, 55
Switchgear Div..... 88
Indiana Steel & Wire Co., Inc..... 140
Ingalls Iron Works Co..... 81
International Harvester Co..... 207

Johns-Manville 66

Kaiser Aluminum & Chemical
Sales Inc.....196, 197
Kennecott Copper Corporation 44, 45
Kerite Co., The..... 92
Kim Hotstart Mfg. Co..... 186
Klein & Sons, Mathias..... 150
KPF Electric Co.....10, 11
Kuhlman Electric Co.....12, 13

Lapp Insulator Co. Inc..... 30
Leach Corp., Inet-Palmer Div.... 26
Line Material Co....67, 68, 69, 70, 71

Malleable Iron Fittings Co..... 182
McCabe-Powers Auto Body Co... 91
Minneapolis-Honeywell Regulator Co. Industrial Div. 180, 181
Moloney Electric Co.....16, 17
Monsanto Chemical Co..... 157
Motorola Communications & Electronics, Inc. 82

National Telephone Supply Co... .40
Nelson Electric Mfg. Co..... 184

Ohio Brass Co.....141, 142, 143, 144
Okonite Co., The..... 4
Onan & Sons Inc. D. W..... 184

Page & Hill, Inc..... 72
Palnut Co., The..... 158
Pennsylvania Transformer Co..23, 24
Permutit Co., The.....46, 47
Phelps Dodge Copper Products Corporation 64, 65
Porcelain Products, Inc..... 171
Pratt-Daniel Corp. 185
Preformed Line Products Co..... 74

RT&E Corp. 176
Radio Corp. of America..... 25
Republic Steel, Steel & Tubes Div. 153
Rockbestos Products Corp..... 183
Rome Cable Corp.....172, 173

S&C Electric Co.....6, 7
Sangamo Electric Co..... 75
Searchlight Section 204, 205
Simplex Wire & Cable Co..... 41
Southern States Equipment Corp. 27
Square D Co..... 151
Subox Inc. 170
Superior Switchboard & Devices Co. 186

Tel-E-Lect Products, Inc..... 175
Texas Co., The.....2nd Cover
Thiel Tool & Engineering Co. Inc. 194
Thomas & Betts Co., The..... 9
Thomas & Sons Co., R..... 90

Union Carbide & Carbon Corp.
Bakelite Co. Div..... 83
United States Rubber Co..... 56
USCO Power Equipment Corp... 166

Victor Insulators Div.
I-T-E Circuit Breaker Co..... 169

Wagner Electric Corp.....28, 29
Westinghouse Electric Corp.
32, 33, 48, 49, 76, 202, 203
Westinghouse Electric Corp.
Lamp Div. 192, 193
Wickwire Spencer Steel Div.
Colorado Fuel & Iron Corp..... 61

■

PROFESSIONAL SERVICES 214

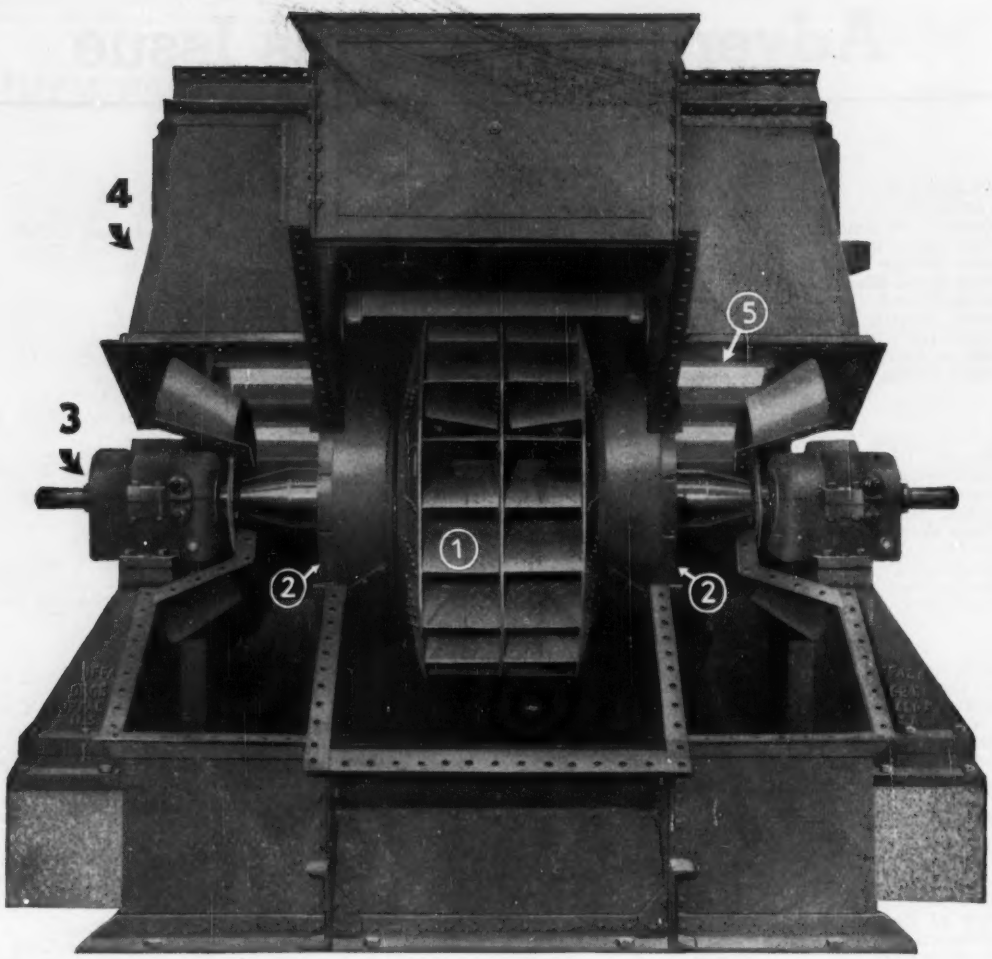
■

CLASSIFIED ADVERTISING
F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES..204, 205

PROPOSALS 205

EQUIPMENT
(Used or Surplus New)
For Sale 205



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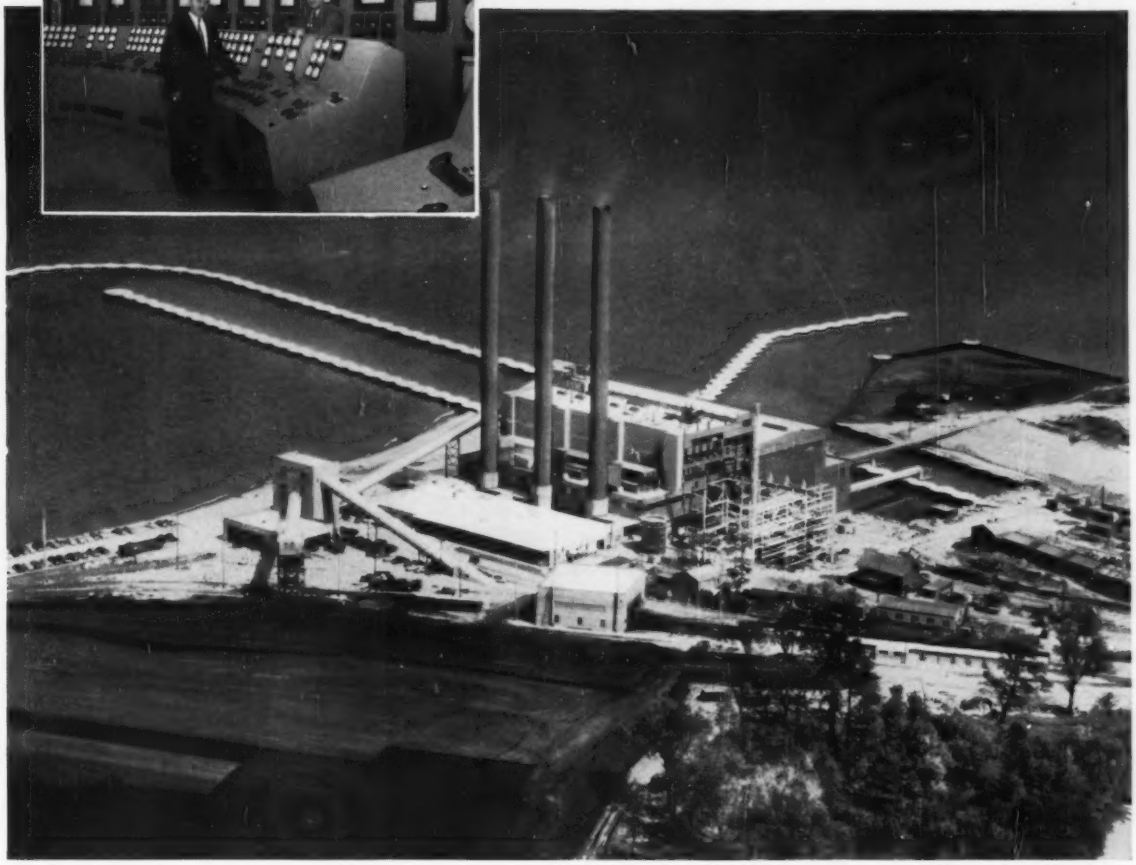

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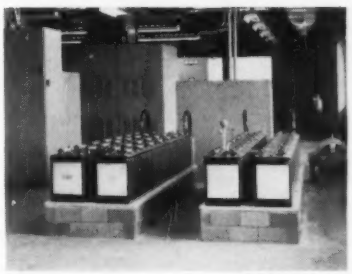

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